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The HIGH SCHOOL JOURNAL

Teaching Aids in the Secondary Schools

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The HIGH SCHOOL JOURNAL

SAMUEL M. HOLTON, *Editor*
Professor of Education, University of North Carolina

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Technology in the New School*

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SPUTNIKS and satellites of a dozen sorts whirl over our heads daily; Olympic events of today in Rome are seen via television in American homes this evening; the office worker nonchalantly glances from her air-conditioned room hundreds of feet above street level; we now outrace the sun in commercial transportation—with breakfast in New York, lunch over middle America and an afternoon swim in the Pacific. New books are read by millions within a few weeks of publication, and newly discovered wonder drugs are rushed into mass production and medical techniques changed almost overnight. All of these are the blessings—and perhaps the blight—of technology.

But across the land school began again this September. The hushed murmur, the rote reading and memorization, and the lethargic half-knowing teacher and her inglorious Miltons indicate to us that, in general, the schools, teachers, students, trudge on almost oblivious to technology and the great changes that it might create in the teaching-learning process. We seem to be in two different centuries, or two different civilizations, or two different constellations, even!

The technological revolution, and its resultant automation, has wrought tremendous changes in manufacturing and business procedures. Many suggest that the same procedures can be adopted in education. Others, just as vehemently, insist that the creative learning process is much too different from the standardized procedures for making automobiles, and that little if any of automazation can apply to such an individual endeavor.

But while the touts of technology[1] and the shamans of the moderately-minded persons sees that changes are long overdue, that *status-quo*[2] joust at each other from parallel tracks, the majority of problems of critical nature cry for solution, and that the force of

* Copyright, 1960, Curtis Paul Ramsey.

[1] James D. Finn, "Technology and the Instructional Process," *Audio-Visual Communication Review*, VIII, No. 1 (1960), 5-26; Gene C. Fusco, *Technology in the Classroom Challenges to the School Administrator*, OE-34004 (Reprinted from *School Life*, March, May, 1960; Washington: Government Printing Office, 1960), 12 pp.

[2] Ernest Earnest, "Must the TV Technicians Take Over the Colleges?" *American Association of University Professors Bulletin*, XLIV, No. 3 (1958), 582-588.

circumstances demands some adjustment within the teaching profession.

FORCES FOR CHANGE

Many forces are at work to demand changes in our *modus operandi* of the public schools. Some pressures have been reported on the front pages of our newspapers for over a decade, while others are much more recent in their origin. All contribute, however, to an overwhelming demand for change.

Teacher Shortage-Population Expansion. The tremendous expansion of the school population, related to the impetus of World War II, has resulted in a tidal wave of additional new students to be cared for. Unfortunately, this heavy enrollment must be taught by those adults who represent the birth rates of the 1930's. A cruel dilemma is created by our most diverse birth rates of the century.

The expanding economy, with resultant new professional fields —many with high social priority and prestige—takes more and more of those persons who might have chosen to enter the teaching profession in a less critical era. It is estimated that there will be a shortage of 195,000 teachers in the public schools in 1960, if desirable pupil-teacher ratios are maintained.[3] Most of this shortage is represented by the unprecedented growth in enrollments. In one decade, our enrollments have increased by 44.5 per cent![4] The most critical area of the moment appears to be the secondary school. With an increase last year of 10.7 per cent in enrollments, an additional 5.1 per cent increase in forecast for 1960-1961.[5] An expanded birth rate cannot be made retro-active; there appears to be *no way* to garner enough qualified teachers to man our schools at current standards during this generation. Some radical change seems to be inevitable, if our pursuit of excellence is to be maintained.

The Sputnik Syndrome. The complacency of America was shocked by Soviet triumphs in space exploration. Such efforts seem to be directly related to previous educational efforts by the Communists. *Ergo,* good science means good schools, poor research means poor schools; therefore, to emmulate Russian scientific exploits, emmulate Russian schools. And so the second great debate has raged. High ranking "admirables" with low ranking opinions of the role of the American public schools in fostering our demo-

[3] Ford Foundation, Office of Reports, *Time, Talent, and Teachers* (New York: The Foundation, 1960), p. 6.
[4] National Education Association of the United States, Research Division, "Spotlighting Public Education in 1960," *Research Bulletin,* XXXVIII, No. 1 (1960), p. 18
[5] *Ibid.*

cratic way of life, have advocated sweeping changes in our school operations and curricula.

Many well-meaning but poorly informed private citizens have joined the hysterical clamor for "tough" curricula or "basic" education by comparing the achievements of the top 10 per cent of European school graduates with the *modal* graduate in America. Both antagonists misunderstand the social significance of the schools of all three areas, and mistakenly believe that elements from European, or Russian, or American schools can be transplanted readily to another culture with little or no significant change in either the element or the receiving culture. Schools in *any* society are not that arbitrary or superficial. Even so, the demands of such critics cannot be taken lightly, must be answered directly or forthrightly, but increase even more the pressures for change.

The Pursuit of Excellence. Because of the efforts of our public school movement in the past five decades, parents of current students possess a higher level of schooling than *has existed ever before anywhere* in the world. In the past teachers could bask in the appreciation of illiterate parents for *anything* which was taught their children, because it would be more than the parents had ever experienced. Not so today. In some communities the level of schooling of some alert and active parents surpasses that of the average teacher. With the heavy teacher shortage, and an additionally heavy turnover—now runing about 10 per cent annually[6]—one may expect to find many parents with either training or teaching experiences superior to that of the teachers of their children. Such parents are apt to place more critical and better informed pressure on schools and teachers for improvement than has existed in previous times.

Demands for new levels of excellence will continue, become greater, and necessitate forthright and professional improvement of our schools and our curricular offerings. Such pressures will be terrific on the *laissez-faire,* inept, or inexperienced teaching staff—and these categories comprise a half or more of our total teaching force today.

Explosion of New Knowledge. For many teachers much of their basic instruction of two decades ago is either seriously in error, or fragmentary by today's standards. Tremendous reorganizations are taking place in science and mathematics content which will affect the entire secondary curriculum, and have specific influences in these subjects for many grades below the high school level. Our

[6] Ford Foundation, Office of Reports, *Time, Talent, and Teachers,* p. 6.

teaching of basic concepts of economics, anthropology, sociology, psychology, and even music, arts, and literature, are fragmentary when compared to the vast cultural accumulations of the several cultures of the world.

Our myopic concern with so-called "Western Civilization" has left almost all of us cultural illiterates regarding Asian, African, and Middle Eastern contributions, not to mention Indonesian and South American efforts. The harried teacher may protest in vain that "there isn't room in the curriculum for all the things all the people would like to see included!" The fact that such a sorely pressed teacher is right only obscures the basic point—*under no conditions can we continue as we have* in public education. We are being asked—ordered almost—to teach more children, with fewer teachers proportionately, more subjects, to greater depth and with greater brilliance, and to do it quicker—for national security. We must manage to meet and surpass every one of these demands, but in our own professional context, with concern and compassion for the integrity of the individual held uppermost.

TECHNOLOGICAL DEVELOPMENTS

What then are some of these new developments which have so enamoured the guardians of commerce and finance? What is new, or revised, and what are some of the possibilities for their utilization by teachers and students?

Radio, Recordings, and Tapes. The imprisonment of important sounds and their utilization by future generations is a breath-taking achievement not yet fully comprehended by the teaching profession. Now available, and constantly being added to, are all of our most important historic events, speeches, etc., personal reading by outstanding authors of their own literary works, important but fragile or disappearing sounds of near-extinct activities, people, animals, machines, etc., and sounds too small or too large—or too dangerous—to be experienced directly. These sounds we now can retain forever—imprisoned in time and space for eternity if need be—as wonderful teaching resources.

Organized programs of study via radio are utilized in many school systems—both urban and rural. Often such projects serve to enrich, supplement, or amplify instruction, or to create interest for further study, which would not be possible individually in each of the receiving classrooms. Some statewide educational radio networks already exist, and cooperative efforts indicate that broader

services may shortly appear. In many places even these radio programs are recorded for future use, or re-use at more convenient subsequent times.

Educational and Commercial Television. To the dimension of broadcast sound has been added video broadcast. Early capitalized upon for commercial and entertainment purposes, television has been broadly introduced into schools. More recently, systems and networks have been established completely under the jurisdiction of school authorities. It has been announced recently that an airborne television transmission experiment promises to bring television instruction to a potential five million students in five midwestern states.[7]

Quite often commercial broadcast television presents programs of educational utility. While generally these programs are not shown at convenient in-school viewing hours, they may be transferred to film—videoscoped, or more recently made permanent by electronic video-tapes. All may be added to the repertoire of resources for the teacher to call upon at a later time.[8]

Organized programs of study have been made available, with scope, sequence, and adequate continuity planned into them, through such efforts as the Continental Classroom series, the White Physics Films, etc. More so-called instructional "packages" are planned and may be available shortly.

Teaching Machines. While automation, and its possible implications for instruction are rather new, the basic principles of teaching machines are not.[9] Many automated tutoring devices and learning aids have been developed during the past 35 years, some in no direct way related to the early work of Pressey. To create some order in the broad field of audio-visual learning aids, however, a general definition of teaching machines is essential.

Fry, Bryan, and Rigney[10] suggest that the following components are necessary for a device to be considered a teaching machine: (1) The device should visually present an element or unit of verbal-

[7] *Midwest Program on Airborne Television Instruction,* A Regional Exploration in Education (Lafayette, Indiana: The Program, Purdue University, 1960), p. 8.

[8] For a more inclusive study of educational television see: *Closed Circuit Television,* Teaching in Washington County 1958-1959 (Hagerstown, Maryland: The Board of Education, 1959), 50 pp.; *Interaction in Learning:* Implications for Television (Washington: National Educational Association, Division of Audio-Visual Instructional Service, 1959), 64 pp.; *Opportunities for Learning: Guidelines for Television* (Washington: National Education Association, Division of Audi-Visual Instructional Service, 1959), 88 pp.; E. G. Sherburne, Jr., "ETV Research in the Decade Ahead," *Audio-Visual Communication Review,* VIII, No. 4 (1960), 192-201; U. S. Office of Education, *Television in Education,* by Franklin Dunham, *et al.,* Bulletin 1957, No. 21 (Washington: Government Printing Office, 1958), 124 pp.

[9] Sidney L. Pressey, "A Simple Apparatus Which Gives Tests and Scores—and Teaches," *School and Society,* XXIII, No. 586 (1926), 373-376.

[10] Edward B. Fry, Glenn L. Bryan, and Joseph W. Rigney, "Teaching Machines: An Annotated Bibliography," *Audio-Visual Communication Review,* VIII, No. 2, Supplement 1 (1960), p. 5.

symbolic information, generally in an interrogative form; (2) Some provision should exist for the student to respond directly to the question; (3) Immediate knowledge of results of the question-answer sequence should be provided; (4) Progress to the next element or unit should be impossible until a correct response has been made to the original stimulus question; and, (5) The content of the presentation should be organized in small, logically organized, equal units of progression.

Many elaborations are possible within these criteria. The "machine" may be a printed text book, a standardized test answer sheet, a simple scroll within a box, or more elaborate "papers within boxes" until one combines electronic computers, films, and complex push button control and response panels to produce almost completely automated "tutors".

There are two serious limitations to the general criteria developed by Fry and others. One relates to the demand that the question be presented "visually." This distinction seems altogether too arbitrary, and devices designed for auditory presentations in conjunction with visual displays should be perfectly appropriate for inclusion within the category of teaching machines. The second limitation is the demand for unit presentation in the interrogative form. The question is merely a check device to warrant progression to the next element. It is the evaluation of functions, but not the *main* function. The primary consideration should be logical and concise presentation of new information or relationships for *new learning.*

Automated tutoring devices have been widely employed by the military services for intensive instruction where only small tolerances of learning error can be allowed. More recently industry has utilized such devices—particularly in the electronic fabrication field —where training and retraining on new designs must proceed along with direct manufacture and modification.[11] Whether the devices are employed in military, industrial, or academic surroundings, their utility is sharply limited by the quality of the programmed content materials. Skinner suggests that the nature of the programming is the true measure for determining whether devices are tutoring machines or audio-visual aids. He indicates that

[11] For additional information on teaching machines see: Eugene Galanter (ed.), *Automatic Teaching:* The State of the Art (New York: John Wiley and Sons, Inc., 1959), 198 pp.; A. A. Lumsdaine and Robert Glaser, *Teaching Machines and Programmed Learning:* A Source Book (Washington: Department of Audio-Visual Instruction, National Education Association, 1960), 400 pp.; A. A. Lumsdaine, "Teaching Machines and Self-Instructional Materials," *Audio-Visual Communication Review,* VII, No. 3 (1959), 163-181; Institute for Communication Research, *New Teaching Aids for the American Classroom* (Stanford, California: The Institute, 1960), 173 pp.

many audio-visual aids and tutorial devices, even while supplanting many teacher functions, may actually free the teacher for those functions to which the machines can contribute little or nothing—"the productive interchange between teacher and student."[12]

Language Laboratories. Foreign languages have been taught for thousands of years, and recordings for self-teaching have been available for several decades. While language laboratories have not been automated to the extent of the tutorial devices just described, great strides have been made in establishing advanced electronic circuitry within the foreign language classroom or laboratory.

Briefly, a language laboratory consists of several pupil stations—one for each student in a classroom situation—and a teacher station or master console Through electronic circuitry any combination of students, from individual to entire class, can be presented audio and/or visual stimuli to which they may either respond privately, or directly to the teacher. When working privately and with transcribed material, the teacher may monitor any one or all of the students, correct faulty pronunciations, or revise materials or presentations.[13]

Expanded Uses of Older Media. The "instructional package" as it is conceived in mid-twentieth century contains many interrelated elements. Films, film strips, recordings, flannel boards and other graphic devices, the use of film transparencies for over-head projection, and books, graphs, charts, posters, and realia are used together for enriched instruction. Any and all of these media can be and are being used in conjunction with all the newer educational media. The professional teacher must now expend some considerable time and energy in the wise and judicious selection of the most appropriate materials and media for specific teaching requirements.[14]

One Process: Evaluation and Teaching. Inherent in the concept of automation and technological systems is the principle of continuous knowledge of the process, measurement of the relative de-

[12] B. F. Skinner, "Teaching Machines," *Science*, CXXVIII, No. 3330 (1958), p. 969.

[13] For an expanded reference to language laboratories see: José Sanchez, "Twenty Years of Modern Language Laboratory (An Annotated Bibliography)," *Modern Language Journal*, XLIII, No. 5 (1959), 228-232. (In fact, the major portion of this issue is devoted to the subject of language laboratories.); Frederick D. Eddy and Elton Hocking, "Language Learning Today—45 Questions and Answers," *Audio-Visual Instruction*, IV, No. 6 (1959), 196-218.

[14] Excellent discussion of broader uses of existing media can be found in: Henry R. McCarty and Horace C. Hartsell, *The Cooperative Approach to Audio-Visual Programs* (Washington: Department of Audio-Visual Instruction and Department of Rural Education, National Education Association, 1959), 88 pp.; Neal E. Miller and others, *Graphic Communication and the Crisis in Education* (Washington: Department of Audio-Visual Instruction, National Education Association, 1957), 120 pp.; Department of Audio-Visual Instruction, *Planning Schools for Use of Audio-Visual Materials*, No. 1 Classrooms (3rd ed.; Washington: The Department, National Education Association, 1958), 64 pp.

grees of success in meeting the specifications of the process, and subsequent modifications in the process to more nearly meet the specifications originally established by the process programmers. This principle of continuous evaluation and adjustment of the process is known as "feed-back." One of the simplest analogies in mechanical systems would be the process of thermostatic control of heating and cooling. Immediate knowledge of results of the output of the unit are fed back to the unit to adjust its renewed output.

A similar principle will apply when technology is broadly applied to the instructional process. Evaluation of many sorts has always existed, with varying degrees of precision. However, the teaching-learning act is so individual and unique that precision of measurement of learning (or of teaching) efficiency has not yet been achieved. As standardized achievement testing assumes almost universal proportions in the United States, more direct attempts are being made to measure a part of achievement with precision, and through rapid evaluation procedures make continuous and almost instantaneous adjustments in the instructional process. The use of high-speed electronic computers to analyze the results of achievement tests on system-wide bases has recently been reported.[15]

Quite soon, then, teaching and evaluation will merge into one continuous process—this very concept is basic to the automated tutoring devices. In truth, separation should never have occurred, and the merger of these functions probably means that instruction again will be much more responsive to the state of the individual learner.[16] Evaluation will be more intensive, more continuous and more comprehensive from the point of view of the curriculum designer or "programmer," but from the point of view of the individual student, will be more personal, more enlightening, and will allow for more direct self-appraisal and guidance.[17]

TECHNOLOGICAL ADVANTAGES

In America we almost consider that everything new is, *ipso facto*, superior to what has existed previously. Technology continues to advance; changes continue to be made; is life better or worse accordingly? The machine, or machine technology seems to have a sinister aspect about it. Will the introduction of such processes into the classroom produce the same dehumanization experienced

[15] *Time*, LXXVI, No. 6 (August 8, 1960), p. 66.
[16] Curtis Paul Ramsey, "Testing in Tomorrow's School," *Educational Leadership*, XVII, No. 8 (1960), 503-508.
[17] U. S. Office of Education, *Understanding Testing*, Purposes and Interpretations for Pupil Development, by Kenneth F. McLaughlin (ed.), Bulletin OE-25003 (Washington: Government Printing Office, 1960), 24 pp.

when workers in industry were replaced by machinery? Will students as well as the instructional process become automated?

Individualization. Increased automation should not necessarily produce less individuality within the classroom. The hamstrung and harried teacher, beset by a myriad of conflicting demands, pressures, and responsibilities, probably can give very little of the individual attention to learners that we prize so highly. The teacher ignorant of the effect of her instructional processes (as most of our teachers currently are) is also unable to guide effectively each of her charges. While it is true with automated data processing that "the student becomes a series of holes in a card," it is much more pertinently true that these same holes may tell us much more about that student than we ever knew before.

Quality and Quantity. Our public schools continue to perform the social miracle of minimum universal education for all of the children of all of the people. In the face of such success—in 1959-1960 an estimated 83.6 per cent *of all children* between the ages of 5 and 17 were enrolled in public schools[18]—arguments about quality versus quantity are ridiculous. The advancing technology can do much to improve the very good minimum job which has been done.

Reorganization and redeployment of the instructional force are the keys to improved quality instruction in the face of advancing school enrollments. Both steps are possible only through some acceptance of and utilization of technological advances. Whether this means be educational television, expanded uses of films, large class size, or individual circuity for learners. Suggestions from many directions indicate that additional quality instruction can be secured through such expanded uses.[19]

Accelerated Learning. It is a well known axiom of teaching that each person learns in his own way, at his own speed. Under conventional methods of mass instruction, however, it is necessary for the teacher to teach at the speed of the slowest learner in the class. Not only is such teaching barbarious, it is also wasteful and inefficient. More individualized instruction, through technological means, may allow brighter children to progress at a faster pace. In any event, through such means no child is penalized in his *learning* processes by the needs of any other child. Machinery with "in-

[18] National Education Association of the United States, Research Division, "Spotlighting Public Education in 1960," *Research Bulletin*, XXXVIII, No. 1 (1960), p. 18.

[19] Cf., J. Lloyd Trump, *Images of the Future* (Urbana, Illinois: Commission on the Experimental Study of the Utilization of the Staff in the Secondary School, University of Illinois, 1959), 15-30; Beardsley Ruml and Donald H. Morrison, *Memo to A College Trustee* (New York: McGraw-Hill Book Company, 1959), 16-44; Ford Foundation, Office of Reports, *Time, Talent, and Teachers* (New York: The Foundation, 1960), 52 pp.

finite patience"[20] can be paced for each; more advanced students can cover the ordinary contents of a regular semester course in as little as a dozen or so clock hours with teaching devices!

Through such acceleration, two excellent alternatives are offered the more able student. He may choose to study much more deeply and intensively in a particular subject area, and thus further accelerate his learning and accommodation to the constant struggle with expanding knowledge. Or, he may choose to utilize the freed time in a broader study in several related areas of knowledge that would have been unavailable to him previously. In either choice, the advancement of knowledge, the stimulation of constant learning, the melting horizons of ignorance, are ample rewards for a modification in teaching processes. Such technological advantages place the responsibility for learning right where they belong; on the shoulders of the learner. In fact, some researchers in teaching machines have indicated that some "demotivationization" of their devices may be necessary for optimum mental health of the student! In the past, our greatest limitations to creative learning have been those of limited competence in teaching. In the automated classroom of the future, the only limitations will be those of intellectual capacity of the learner—a quantity barely understood and inadequately fathomed to date.

Professionalized Teaching. Through an accumulation of centuries, the teaching profession has been handed additional responsibilities for the care of the young. In present-day American public schools the average teacher is probably required to give more time to subsidiary "housekeeping" and accounting procedures than she can give to direct instructional activities. Even in the recognized activities generally related to instruction, there are many menial and tedious tasks which could be performed by persons or processes other than the instructional professional. The application of technological advances to instruction offers the hope of freeing the teacher for those important and vital relationships between teacher and learner which have for so long been neglected.

TECHNOLOGICAL DISADVANTAGES

Not all advances are without blight. Many human relationships, modes and manners, and other personal considerations are wrecked by each successive social change. The task of the intelligent consumer/citizen is to insist that social and personal dislocations be kept at a bare minimum at all times, and that possible

[20] Skinner, *op. cit.*, p. 976.

advantages of change be weighed carefully against the tragedy of human dislocation which must inevitably result from change. Almost overlooked in our pell-mell rush for progress is that fact that as rational human beings, we can choose to implement or reject any innovation *if we provide methods for choice.*

Nonprofessional Controls. Most of the newer educational media have been developed by persons with technical concerns in contexts far removed from the academic environment. In the manipulation of the materials of manufacture, few considerations must be made for human factors. Hence, most technicians *start* with the capabilities of their machines and develop the processes most harmonious to maximum utility of the machine. The nature of the machine, or the medium, therefore, predicates all processes and relationships.

In transferring such a concept to the very human and fragile relationships existing between the teacher and the learner, disastrous results can occur. Teachers are not production machines, and students are not raw materials of manufacture. To be utilized in the instructional process, automation must *start* with the nature of the teaching-learning experience, and then be adapted to best serve those criteria. The tremendous difficulty arises when technicians are called in to consult in the adaptation process. Their knowledge is of the machines, the media, and their method of thought is of accommodation to the capabilities of the machine. All too often the originally enthusiastic teacher is early frustrated when attempting to use a new medium. All control and direction of the teaching act is filtered through the medium and modified by the technician, leaving the teacher as a mere puppet or entertainer. It should be recognized that accommodations are necessary by the teacher to utilize a new process, but technicians must be brought to the realization that a different set of criteria for all performance and excellence is required in the instructional act. Educational considerations must prevail foremost.

Mass Education or Entertainment. The first broad utilization of several of our mass media was for entertainment. Viewed in an "entertainment context," the medium itself has been so identified; consequently, the first inclination of many when using the new media is to consider that they must be "entertaining." Motivation and entertainment become confused terms. The concept of mass helps to cloud the issues.

While large numbers can be served through these media, the basic consideration has been neglected: the medium provides a

channel for individual communication. The television or film viewer identifies himself with the message or action; he may be a part of a mass audience, but his reactions are individual, not mob. If actions are called for, or prompted, he acts individually, not in concert. The disadvantage of mass concepts and of entertaining-motivational misunderstandings has not only been solved—it barely has been recognized and identified.

Financial Considerations. The costs of public education (and indeed almost all other costs of living) continue to rise sharply. With burgeoning enrollments can additional expenditures be justified for a broadened application of automation to education? For that matter, can we even long continue our present levels of expenditure for marginal levels of quality? We have no choice; "School must keep."

To continue our democracy we must continue our public schools. To continue our schools, with their increased enrollments, we must accept and use the modern advances. Some advocates have indicated that with mass instruction, larger class sizes and master teachers on the ratio of "one to five million," we eventually will be able drastically to lower our overall school expenditures. To seriously consider such pronouncements is to savor the sirens' song. Quality instruction at the mass medium level calls for tremendous capital outlays. The advance preparation time for one 30 minute presentation may exceed the ratio of 1 x 20, of "on-time" for preparation time. Technicians and specialists of fantastic number are required for that one "master" teacher seen, not to consider the administrative and support personnel required for other normal school operations. "Clearly, the technological aids to teaching, though they may improve the instructional process, will increase the operating costs of the school."[21]

The Superior and the Inferior. The question of relative merit in teaching has not been satisfactorily answered. We expect the same performance of all teachers; we provide the same level of support; we assign the same number of students; and, we pay the same rate to all. All is the same except the teaching process—and the learning achievement—which manifestly are not the same.

This irony has been ignored by those who advocate complete equality in assignment and pay, but must be faced anew when the advancing technology requires the identification of outstanding teachers for special assignments. An heirarchy of rank and prestige is inevitably established when superior, or master teachers are designated—by inference, the remainder are less than superior, i.e.,

[21] Fusco, *op. cit.*, p. 11.

are inferior. Tremendous questions of human relationships, staff morale, and cooperative endeavor must be answered when a "star and supporting cast" system of teaching is established. There are so many ways in which one particular teacher may be superior for some particular student, that our present methods of designating excellence in teaching border on quackery.

THE DILEMMA

No easy reconciliation can be made between the advantages and disadvantages of the technological revolution impinging on the academic world. Some application of automation principles seems essential if we are to continue quantity-quality education for all American children. We must pursue a higher standard of excellence within a framework of concern for the individual integrity of each and every learner.

The teacher, too, possess certain rights and privileges which cannot be dismissed lightly. But some accommodation must come. Professional educators cannot and must not abdicate their responsibilities and ignore their basic principles—many of which seem to be endangered by technological revolution within or against the classroom.

At present there is little actual communication between the world of the technician and the world of the academician. Each suspects that the other would destroy his world if possible. A climate of suspicion has produced little cooperation, less harmony, and almost no sympathetic understanding of the other's point of view. Each has a vital role to play in the classroom of the future; each is indispensable to the success of the other.

The technicians and specialists can provide the means for presently unimagined enriched instruction for all children of all levels of ability. The academician provides the artist's touch and is guided by principles of application of which the technician may be only vaguely aware. In our industrial society we have come to believe that technology can produce anything which we may desire, or solve any problem that we set before it. Technology, and the technicians, however, cannot determine which problems should be solved first, or which procedures will be acceptable. For these decisions are questions of basic value. Machinery, and technology, are neither moral nor immoral, but rather are amoral. Policy and principle are the province of the professional educator; process and production are the realm of the invaluable technical assistants to the teaching-learning experience.

Some Important Values in Teaching and Learning

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A RESPONSIBILITY of the educator is to lend perspective to discussions of teaching and learning. This may, at first glance, be interpreted as a passive role, one that begins and ends in objective and disinterested consideration of questions related to education. Yet today, because of the great forces at work in the world, and because change is likely to be sudden and overwhelming, a discussion of education is not a passive matter. We recognize increasingly that the weighing of an educational question, whether it be of philosophy, content, method, material or technique, is a most active step. We know today that education is society's best and perhaps only means for adjustment and progress into an uncertain future. Without question the stakes are survival and the goal either a good life for all persons or a world-wide extension of the prison state of authoritarianism.

Impressive in education today is the discussion of the coming of age of the technological revolution as it relates to teaching and learning. All persons, all nations are, or will be, affected by this aspect of the long-term scientific-technological advances. All are influenced also by the increasing speed-up in this revolution. The rapidity of change and the possibility of putting such technology to use in the teaching and learning process are factors that are now being urged upon the attention of the teaching profession and the public alike.

We know that technology is putting, or can put, tools into our hands for instructional purposes. How these technological aids are understood, how they are used, what kinds of learnings they will represent, what will be the value commitments of the teachers, the users, the progammers, are crucial matters in a world of rapid and final change.

We must study and understand prevailing conditions if we are to meet these circumstances with intelligence and integrity. In meeting changes quickly and finally, the centralized, or authoritarian, nation has an apparent advantage in that it can adjust

rapidly through a decision by a central authority. The democratic nation, on the other hand, has an apparent disadvantage in having to meet changing needs through intelligent, responsive and qualitative adjustment. Our concern, as a democratic nation, is that this apparent disadvantage may be turned fully to our advantage. Our adjustment must be characterized by exercise of intelligent understanding of prevailing conditions, and by informed discussion and interaction. Through a need for invention and creativeness, sound decisions will be made and adjustments will be arrived at. Such a process will, we believe, in the long run be far superior to adjustments made arbitrarily by a centralized power or society.

Our concern in education in a democratic society is that we will create conditions that will exemplify and illustrate our values in action. In such education the young can achieve an intelligent understanding of the realities of their world, can experience growth through discussion and interaction, can learn to respect and use inventiveness and creativity, and can practice the method of intelligence in making and in recreating the setting in which they live and grow. Our great danger is that we will, through lack of insight, deliberately limit the young in their opportunities for growth and development, for firsthand contact with existing problems, and with the resources and methods for solving such problems. We must make available to the learner and the teacher all the advantage that can be theirs as a result of invention in all areas of our burgeoning culture. Means and resources must not be denied either the teacher or the learner because of our holding to traditions or patterns that were created in times characterized by scarcity and by less far-seeing leadership.

CLAIMS OF TECHNOLOGY

School people today are bombarded by news and by claims of developments in the instructional media. Particularly impressive are advances in technological aids, in audio-visual materials, and in automatic teaching devices. Advances in electronics are being applied and extended in many aspects of education. We now seem to have reached a point at which the great debate is directed, not so much toward the possibilities of creating the *means,* but rather toward the *ends* which such instructional media will serve. For example, what ends will be served by the much-touted "Instant spelling," "Instant physics," or "Instant Russian"?

Extravagant claims are being made, by school people and others, as to the role the technological aids to teaching and learning will

play in "speeding up" the rate of the education process. What are some of these claims?

1. That "more content can be presented to the pupil and "learned" by him more efficiently and in a shorter period of time than by older methods.

2. That technology applied to education can bring about almost "instant learning" through "reinforcement" or "erasure" of responses.

3. That by "teaching" is principally meant the transmission of, and by "learning" is meant the acquiring of, facts or other information or skills.

4. That all matter to be "taught" and "learned" can be programmed so that the pupil will be drawn along the one, inevitable, "correct" way to learning, with full knowledge at each step as to whether or not he has successfully reacted in the one-and-only "correct" way.

5. That teaching and learning are concerned almost wholly with the interaction between the pupil and the teacher, or between the pupil and the lesson presented by television or other audio-visual means, or between the pupil and the lesson programmed on the teaching machine.

Perhaps this interpretation of the implied claims of proponents of the newer technological devices in education is oversimplified or overstated. These claims are, nevertheless, drawn from an increasing body of literature in books and in periodicals.

ELEMENTS IN TEACHING AND LEARNING

What are the principal elements in a teaching and learning situation? First, we have the learner, the pupil, the less-mature or the less well-informed person. Second, we have the teacher, the adult, the more mature or the better informed individual, whether in person or through audio-visual means or other electronic device. Third, we have the environment or setting in which these two elements come together, whether this be the school or some other setting. The object of their coming together is the transmission of knowledge, skills, attitudes, behavior, the cultural heritage—not in a narrow sense but in a full meaning of the term.

Our concern, as school people, is with the teaching and learning situation and with what happens when these three elements are brought together. Always the results of such "bringing together" are the important outcomes, respresenting the learnings, the growth and development, that are the object of schooling. As educators in

a democratic society, we have a stake in the outcome; it is our privilege and responsibility to transmit the democratic heritage, including our cultural processes and commitments, attitudes, behaviors, values. Since democracy is an emergent and recreating society, our schooling must help in the emergence and the refinement of our democracy.

What are some of the factors that should characterize education in a democracy that is emergent, that grows through self-criticism and discussion, through use of the scientific method, through the fostering of creativeness and inventiveness? Some of these factors may be the following:

1. Recognition that our objective is to develop individual potentialities and to meet individual needs in a democratic society.
2. Recognition that the learner, in a final sense, controls his own learning, both as to rate and quality.
3. Recognition that the learning that is accepted, recreated and acted upon by the learner is learning that is recognized by him as self-enhancing.
4. Recognition that the learning that is most effective and functional in terms of democratic values is best achieved in a setting of cooperative interaction, an environment that is characterized by freedom, by friendliness, by respect for personality, by intelligent action and by creativeness.
5. Recognition that the quality of learning is not necessarily improved by facts memorized and recited; rather, such quality is improved as the learner, in association with his peers and with the counsel of a mature person, comes to understand and use a process that will enhance his own growth and that will lead to successively higher levels of future action through need satisfaction.

Important Considerations

It may be that the approach of technology to education will, as its spokesmen claim, make a profound difference in American schooling. Perhaps the introduction of new and improved devices and aids actually will "release" the teacher from "routine" duties so that more of this time can be devoted to individualization of instruction. Here, of course, is the question—whether and how this worthy objective can be accomplished.

Unquestionably the technological devices and aids can be a great boon to teaching and learning. Whether they will or not, may depend finally upon several considerations which relate to values, to the "tendencies to action," on the part of those who

invent, program and use these devices and aids. Some of these considerations are the following:

1. That use of these machines and devices shall be based upon a modern, field theory psychology, rather than an outmoded, stimulus-response, or behavioristic psychology. There is little question but that human beings (as well as animals) can learn through stimulus-response methods and devices. Yet what is the orientation of such learning? When such authoritarian learning is undertaken, it should be only for a limited, specific purpose. It should not be used for the general education of the young in a democratic society. In returning to a stimulus-response psychology of learning, the technologists have perhaps unintentionally done a disservice both to education and to the technology which they wish to adapt to educational uses. It may be the task of the modern educator to apply the devices and aids to uses consonant with a modern field theory psychology.

2. Another consideration in education relates to the questions raised by the so-called "instant learning" claimed for the new aids and devices. Is "rate," or speed of learning, the only important consideration? What are the concomitant learnings in such an arbitrarily speeded-up process? What is the value orientation of the learner who undergoes such manipulation? Are there not values other than speed in learning? What can be said for the importance of contemplation? for time to recreate and to react to the learning? for time to examine one's own motives and to formulate one's own thoughtful and intelligent response? for time to conduct research to formulate and test hypotheses? Can such learnings be drawn forth by the much-vaunted immediate "reinforcement" or "erasure" of responses?

3. Of extreme importance is the recognition that learning is a much more complex process than we have understood it to be. Only occasionally have we conducted ourselves as though we actually understood and believed that the only important learning is qualitative, rather than quantitative. So much of our schooling has traditionally been based upon the idea that number-of-facts-learned-at-an-increasing-rate-of-speed was our indication of excellence in education.

How much readier we would now be for the introduction of technology into education if we had long been accustomed to regarding learning as a *qualitative process.* Learning is not the storing up of bits and pieces, nor the making of a stockpile of items, to be kept and called upon for use, still as the discrete items they

were when they were acquired. Rather, learning that is accepted and used is always recreated by the learner. The learner is not entirely a "blank page"; the intellect is there, the organism is there, the self has its part in selecting, in accepting, in recreating the learning for use and in deciding upon the purpose for which it will be used.

4. It may be that much matter to be taught and learned can be programmed so that the pupil will be drawn along the one, inevitable, "correct" way to learning. Yet will not this rigid channeling tend to eliminate some of the most valuable experiences in learning? Will this not tend to keep the learner from questioning beyond the item or beyond the lesson of the moment? Will this not tend to stifle invention and creativity? What of the dangers of too-quick closure in learning? Is there only one road to a significant learning? What programmer can know enough to set up such "inevitable" paths for the young and alert minds of the coming generations?

The success of the devices and aids in meeting the needs and developing the potentialities of the individual may finally depend upon how close the programmer actually is to the individual learner, how well he understands his problems, how much the learner himself brings to the solution of his problems. The richness, variety and fluidity that characterize qualitative learning *can* be enhanced by technological means. This can be accomplished, however, only by intelligent and responsive planning and adaptation of instruction by those close to the individual learner.

5. Teaching and learning is always more than the interchange between the teacher and the pupil, or between the pupil and a machine or device. To deny this is to return to a psychology that is no longer defensible. The strong supporter and expediter of learning is the firm, friendly and understanding *interaction* between and among the learner, his fellows and their teacher. The organic group is still the setting that gives the individual the best opportunity to come to an understanding of himself and to relate himself intelligently and confidently to his companions, his teacher and to society.

Technological aids and devices will be most effective in contributing to teaching and learning when educators are able to assign to them the tasks they can best acomplish. Only through such a value-conscious approach can the advantages made available to us through the technological revolution be fuly utilized in the schools in our democracy.

Creative Teaching in the Mechanized Classroom

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THE accelerating technological advance and the resulting changes in our social organization and institutions which are now taking place have radically changed our concept of the adequate teacher. In a society where change, although present, was so slow that it was perceived, if at all, as a slight displacement from "normal" conditions it could be assumed that the ways of teaching which were considered adequate for the present would, with a little up-dating of specific information, be adequate for preparing children for the future as well. The function of a teacher in such a society is fairly simple. She merely has to teach the children what the adults who are successful in the society already know. In such a society the general idea is that the essential discoveries about the universe have already been made, that human values are well determined and universally known, and that except in a few technical areas everything which needs to be known is known. The chief aim of education in such a society is, therefore, the transmission of the wisdom of the past. Even in the area of teaching practices, little more needs to be known.

But at least twice in history, in the Mediterranean civilization of ancient Greece and in the Western civilization of today, societies have broken through into a greatly increased tempo of discovery and change, with each new discovery leading to social and political problems whose solution in turn leads to new problems for the solution of which the experience of the past offers little precedent. Our children, like the children of ancient Athens, newly industrialized and newly democratic, will live in a world where last year's wisdom may be next year's folly, where they have to solve problems their fathers could not even imagine. In the atomic age their survival and the survival of the values for which we live will depend on the ability of our schools to equip them for the task. No wonder teachers are being asked to be creative.

Unfortunately, the citizens and taxpayers who support our schools are not very clear about what they want the creative teacher to create. Educators, when they recognize a crisis have two tradi-

tional methods of response. (1) They may run up and down shouting "We must do more of it because it doesn't work." or (2) they may run to and fro screaming defiantly "It doesn't work so we must do the opposite." One or the other of these demonstrations, depending on the temper of the community, can usually keep a shaky administration in office two or three more years by which time the crisis may have passed. But neither seems able to provide an adequate rationale for dealing with the problems which confront our country. Nor is it enough to declare for excellence and longer hours of instruction without deciding what we mean by excellence and how the longer hours may be used to achieve it.

The excellence of a product is always judged relative to the use for which the product is intended. To the extent that the purpose of education is limited to the transmission of verbal information the best student is not a human being at all but a reliable and accurate recording machine. But as we face a very uncertain future in which the routine activities of production will be more and more taken over by automatic machines it seems more and more worthwhile to prepare human beings for these necessary functions which have to be carried out by people because they cannot be done by machines. The main purpose of teacher creativity, it seems more and more clear, must be the development of creative and responsible students who will become creative and responsible citizens.

This cannot be a program which will devote part of the school's resources to the development of an elite leader group. It must embrace the whole population of our society to the full extend of their individual abilities.

The people who want our schools to concentrate on the education of an intellectual elite and say of the academically inept "Let them dig ditches," cannot have noticed that our ditches are now being dug by machine and that no one can afford to have them dug by hand. As a result of the post-war technological and organizational revolution routine labor is economically impractical, even in the occupations which are not covered by minimum wage laws. Machinery is cheaper and more reliable.

The need is for creative, responsible workers at all levels. The functions of designing, servicing, and repairing a machine in the home or on the assembly line and of designing, serving, and repairing a sector of our social organization still have to be done by people because they call for imagination, resourcefulness, and a deep sense of responsibility as well as for skill. In the modern

factory, the modern army, and the modern community the function of each individual has become so highly specialized that they cannot be supervised and so vital to the functioning of the institution and, in many cases, to the physical survival of other members of society that the most important qualifications are the character traits of responsibility and devotion to duty. If these key people, who make up a greater proportion of the population each year, are to remain at their posts they will have to understand the purpose of their work in human lives and human values. They will also have to feel deeply identified with the society they serve. An American prisoner in Korea wrote a letter, published in Communist and neutral newspapers all over the world, thanking the Chinese People's Republic "for teaching me to read and write because in my home city of Pittsburgh only the children of the wealthy are allowed to read and write." When asked why he wrote the letter, of incalculable value in the cold war, he answered "I didn't think it would make any difference." People who have not been helped to discover their own significance and value to society are not likely to feel responsible for their social acts. They remain social and political non-participants, what the greeks called "idiots".

The people who advocate concentrations on the education of "leaders" seem to have forgotten that to be a leader a man must attract followers. Even in a totalitarian state the titular leaders are impotent to lead where their public will not follow. The most brilliant and far sighted leadership cannot function without followers who share their leaders aspirations, goals, and hopes. Creative leaders can win influence only in a society where people are disposed toward creativity; their dreams can be brought to fruition only by the solution by creative specialists of the thousands of minor problems which the leader-dreamer can never anticipate.

Fortunately we are beginning to know quite a bit about creativity and responsibility; enough, in fact, to enable people here and there to teach them. And, again fortunately, they seem to go together.

Creativity, it seems, does not directly result from factual information. In fact, some kinds of knowledge interfere with creativity. Ready made solutions which keep us from looking for better ones, cultural expectancies and stereotypes which are used in inappropriate situations, and premature concentration on detail (encouraged by many "fact minded" teachers) all lead to what one psychologist has called the "trained inefficiency of the expert." Most

of the really revolutionary ideas in human history have been the products of young people and amateurs who bypassed traditional obstacles because they did not know the traditional modes of thought. This is not to say that ignorance is the mother of invention or that it is even helpful. The solution of any complex problem calls for a great deal of knowledge about a wide variety of things but the creative act itself is a matter of putting them together in a new and, to other people, an unexpected context.

The unique characteristic of a creative person seems to be a particular point of view about himself and toward the world. He sees himself as active and the world as something to be changed. He is, in his own mind, a person who can do some things which have not been done before. He sees the world as unfinished and feels a responsibility for improving it. As a result he is more likely than other people to recognize new problems and to attack them. Because of his perception of the world as unfinished and of human knowledge as incomplete he is likely to be a nuisance to a fact-transmitting teacher, who is quite likely to regard him as brash overly self confident and even impudent. "Did you read that in the book or (in a tone of sarcasm) is that your own idea?" was once the accepted way of putting such students in their place.

Fortunately for society the creative student's concept of himself as a person who is able to affect the future tends to give him a feeling of responsibility for the consequences of his acts. But for teachers with autocratic tendencies he is a heavy cross to bear. Everyone is in favor of creative students until one happens to us. When he does our feelings depend on our picture of our function as a teacher. To a teacher who perceives himself exclusively as a transmitter of known truth an aggressively creative student can seem as disruptive as an aggressive delinquent.

Supposing that a teacher does wish to foster creativity and has the fortitude and faith to persevere, here are some of the things which can be done:

First: he should help the student to see himself as a creator and discoverer of knowledge, not as a mere consumer. "In what other ways could this problem be solved?" "Why, Henry, where did you find that? Let me make a note of that." Adolescents are looking hard for personal significance and value and the discovery by a student that he can play a creative role in solving an adult problem can result in a complete reorganization of the student's concept of himself and his place in society. From this point of view the nature

of the problem may not be particularly important. The important thing is that he become personally involved in its solution and that the answer to it is not known. People come to perceive themselves as creative thinkers by solving problems, not by reading about how other people have solved problems.

There are many obstacles in the way of teaching for creativity. For one thing, many of the things we have been doing since the opening of the first schools were originally devised to elicit conformity rather than creativity. How can the teacher mark, for instance, an achievement which surpasses the teacher's concept of what is reasonable or necessary or which contradicts some of his most cherished prejudices?

This leads us to another problem which is pressingly immediate. As a result of organizational and technical advances the per capita productivity of industry has been increasing at the average rate of 3% for many years. During this same time the per teacher and per student productivity of the schools has risen, by the objective measures at our command, very little. The number of children taught per teachers is less than in the 1920's and children and teachers constitute the only large segment of our society which is being asked to work more, rather than fewer, hours. In many homes the conscientious high school student works more hours per week at his lessons than his parents do at their jobs. It cannot be expected that the cost conscious taxpayer will remain undisturbed by this "inefficiency." The schools are to be mechanized, whether the teachers wish it or not. The question that concerns us is, what kind of education will they be mechanized to achieve?

The inventors of many of the first generation machines now on the market are men whose educational experiences have been limited to the schools of their youth or the training programs of industry. They tend to see education as the transmission of factual information and have designed their machines to do that.

It is easy to devise pre-programmed teaching machines, for instance, to do this. In fact, the teaching machines, slides, and television programs can easily be more effective in transmitting information than a mediocre teacher. They can be programmed by experts and are apt to carry more prestige and authority in the eyes of the students than the fallible teacher they have learned to know so well. The disadvantage of the machines, that they are preprogrammed and are therefore unable to deal as effectively as a hypothetical ideal teacher could with individual and local differences is a disadvantage shared by many teachers, who were, more-

over, programmed years ago with facts and concepts which are now obsolete.

We come now to the vital question: Shall we shape our tools to fit our educational objectives or shall we take the easy way and change our objectives to fit the new tools we are offered? At a time when the tradition of fact transmission is still strong it will be very easy for teachers to use the new devices for that purpose alone. It will require ingenuity and creativity on the part of the teacher to use the machines for fostering individual creativity and responsibility. We shall however, be making a grave mistake if we reject them because their usfulness for that purpose is not obvious. Many of the machines now on the market can be valuable aids in a creative program and more could be developed with such a program specifically in mind. Those which can be used independently by individual students are particularly promising. These machines, using tape, slides, and learning programs, can transcend the spatial and verbal limitations of the schoolroom and tremendously enlarge the student's concepts of the world and the roles he may play in it. But the sheer mass of materials, by enlarging the avenues of information available to the student to a point where no student and, even more significantly, no teacher can be expected to know all about any subject the new devices can greatly enlarge the value of each student, as the possessor of unique knowledge to his group. Next, individual tapes, films, and teaching machines can enable a student to progress at his own pace, without the boredom of waiting for slower classmates, and without the frustration of facing material which is beyond his comprehension and which is not needed by his group.

Many problems need to be solved. The work of designing machinery for the full enterprise of the modern school is just beginning. There is already hope for teaching machines with open-ended programming which will give room for the recognition of original solutions. The creative, imaginative teacher will find that the new devices do not tie her to an education by rote but, used with imagination and ingenuity, will give her greater opportunities than she now has for helping her students to develop creativity and responsibility through productive and original achievement.

The Instructional Materials Center— A Service Center for Teachers

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THE rapid proliferation of knowledge in the various subject fields, coupled with the extensive use of new communication devices in the home, in industry, and in the world of government, necessitates a reexamination of the tools of teaching which are used in the secondary school and of the ways in which they should replace or relate to the traditional teaching-learning procedures of reading and lecturing. It is apparent that we must find ways of teaching more material to more people, and doing it in less time than it has taken traditionally. It is doubtful whether this can be done through verbal means alone. For example, if a person were to find himself faced with the necessity of learning as much as he possibly could about Tibet or China in one half hour, it is obvious that he would learn more through seeing a good film or a good television program than from spending a half hour reading a book on the subject. He would learn more in a shorter time because he would be able to see simultaneously many different facets of the daily life of the country, while in reading, he would have to put together one bit of information after another in sequence, and this is of necessity a slower process.

The illustration suggests the necessity for planning classroom presentations in terms of the media of communication most efficient for the purpose and also for finding materials which will appeal to the senses and the emotions, as well as to the intellect, for intellect is not a separate entity in the development of understanding. In today's world, it is essential to use in education all the modern communication devices.

The efficient use of many media makes careful planning of prime importance. It is estimated that thirty hours of planning go into one hour of television teaching, yet the average high school teacher has been allowed only one hour of planning time for five hours of teaching. It is important to extend planning time for all teachers.

It should be noted, however, that not all of those thirty hours are hours spent by the teacher. They include the time of artists,

librarians, researchers, speech and production specialists. New development in the content fields, new materials are called to the attention of the teacher or reviewed in such a way that he can use them in teaching. Illustrations and demonstrations are a part of every presentation. Films and tapes are readily available, and only the pertinent parts are selected for use. Persons and places of interest are visited whenever they can contribute to the depth of underestanding of the presentation. Such teaching with this wide variety of resources is only presentation. Its great drawback, of course, is that in order to be economically feasible, it must be geared to reaching hundreds of students at the same time with little or no regard for timing and placing of presentation to suit a particular group or individual. Follow-up is too often neglected or conducted without availability of comparable resources for reteaching or for further exploration. Yet it is almost a truism that such resources are needed as much for this phase of learning as for the initial presentation.

It is in the provision of this wide range of materials, with experts to help develop them and select them that we find one of the most significant fields for the improvement of education in the secondary school. Resources similar to those just described should be readily available to all teachers if we are to improve the quality of education. The terminology most frequently used at the present time to describe this resource service is the "instructional materials center." Such a center, if well developed, provides for teachers in the school system the same kind of resourceful planning that is provided by producers of educational television programs.

It is the purpose of this article to point out some of the essentials in such a center which is envisioned as a service to teachers, not as a replacement of them.

1. One of the most important tasks of a materials center is keeping up with new resources and developing a program to inform teachers about them. This means not only identifying new materials, but working with committees of teachers who can determine how resources may be used effectively in the teaching program. For example, arrangements can be made to have new books circulated for teacher examination. Frequently this can be done by agreement with the firm from which they will be purchased, so that teachers can explore them prior to purchase. Regular scheduling of previews of films can also be planned. A mimeographed bulletin advising

teachers regularly of new materials or new services will also serve to keep them aware of acquisitions. Traveling exhibits or bulletin board displays which circulate from one school to another may also highlight new materials or their uses. Sometimes a personal note to teachers interested in certain kinds of materials is worth more than a general bulletin. Particularly important is a program of workshops, not only to acquaint teachers with new materials and resources, but to give opportunity for groups of teachers to explore together the ways in which various resources may be successfully used.

2. A second service which a materials center should provide is that of organizing and correlating materials so that they are readily available when a teacher says, "I want to begin work with a unit on . . . ." At this point it should be possible for the materials center to provide a wide range of suggestions: speakers, books from various reading levels and with various emphases, films, film strips, radio programs or tapes, maps or charts, exhibits and demonstrations. Such a service demands that the persons who work in the materials center should not only suggest ideas for use of materials, but should collect from teachers ideas of the ways they have used materials and make these suggestions available to other teachers. Sometimes new materials of value will have been developed by students and should be made a permanent part of the collection.
3. Within this wide correlation, the personnel of the center should also provide assistance in selecting those materials which would be appropriate to the needs of specific groups.
   a. Materials to be used with the total group to give the essential background for discussion and further exploration. This would include films, displays, books or articles which give a comprehensive background of the subject.
   b. Materials appropriate for small groups to use for specialized study of particular topics or phases of the larger subject.
   c. Individualized materials such as books or film strips suited both to the very able student who wishes to pursue the topic beyond the usual academic level and to the student who is a poor reader or the student whose interest is non-academic.

It should be noted that educators have long advocated the use of such variety in the classroom, but the teacher load in most schools

militates against the possibility of locating adequate resources of this nature for each of five different classes every day. Only if an excellent materials center is available and can offer such service will such teaching be possible.

It should further be noted that groups as well as individuals show marked differences which determine the approach to a subject, and the materials appropriate to it. The writer of this article recalls, for example, two groups of seniors with which she worked at East High School in Denver a number of years ago. Both were studying a unit entitled "What Makes Life Worth Living." Emphasis was on literature, art, music, and philosophy. One group read the classics—poetry, drama, and novel, and visited the art museum to hear lectures on art. The other group experimented with writing poetry, with painting and sculpture, and with writing music. They invited resource people to work with them in each phase of their study. The emphasis was on the contemporary and on doing, with the classical used in contrast or for suggestion. The material appropriate to one group was not always appropriate for the other.

4. A good materials center should also have a program of experimentation with materials and a program for evaluating their effectiveness when used in various ways. For example, the illustration used earlier in this article as to the value of film or television for covering a quantity of material in a limited time suggests that certain films might well be used as basic instructional material rather than as enrichment as has been customary in the past. Perhaps experimentation is needed to see whether or not some areas of study might not use film or television as the basic background material and books as supplementary, rather than the usual book as basic with film and other visual materials as the supplement. The use of films and film strips for individual study also needs much experimentation.
5. The use of graphics in business and advertising has been very effective. It is probable that the reader finds himself influenced far more by advertising or articles which have nonverbal materials included than by advertising or articles which are purely verbal. It is also highly probable that teaching would be much more effective if charts and other graphic materials could be developed for presentation in the classroom. Only rarely are such materials available to teachers. A good materials center should have personnel skilled in

developing such materials and in helping students learn to express ideas in this way. Such presentation demands a precision of thought which words may not accomplish.

6. A materials center should also collect and make available materials in fine arts, for the fine arts are the gateway to understanding of cultures and people. The writer recalls a teacher in New York City whose students read an account of the Mexican War from a Mexican textbook as well as from an American one. Novels, poetry, drama, newspaper as well as from an American one. Novels, poetry, drama, newspaper comment as well as art and music should be available from many cultures. Recordings can be made of visiting artists' work. Daily life in other cultures can sometimes be better understood through an exhibit of kitchen utensils, toys, or textiles than through verbal description. Ideas, philosophy and history may be more readily understandable through poetry, paintings, sculpture, textiles, ceramics, or music.
7. The importance of people and places as resources should not be overlooked in the secondary school. In today's bedroom communities, for example, few young people have much direct contact with the adult world of work. Both trips and interviews can bring such experience to them. The use of an amplifier on a telephone may make it possible for a whole class of students to interview the personnel director of a large firm, a well known scientist, or the governor of the state. Poets or artists in the community may visit the class. Again it is physically impossible for the teacher to learn all the ways such resources may be used, or even to make arrangements for using them. A materials center should be set up to know who resource people are in the community, how they can be reached, and even to make the actual appointments in some cases. Interviews or visits can be recorded on tape or film to make them available to other groups.
8. The center should also provide equipment and help for development of experiments and activities on the part of students. The new eight millimeter projectors which have just reached the market open up many possibilities for new educational experiences. Educational films will soon be available in eight millimeter, so that the sound track can be made by members of a class or by the teacher. This will also be possible for films which have been made in the school. Thus a whole range of opportunity for creative composition can be

developed with this device. Kits for science or mathematics activity can also be made available. Materials with which to experiment and explore should be a part of every central materials collection. Some school centers make a point of collecting various odd bits of material and filing them away in "junk" boxes. Corks, copper wire, acoustic tile, beads, scraps of unusual paper or cloth, small pieces of wood or leather, yarn or beads may serve to give a teacher an idea for activity or to implement an idea which he already has.

9. Many realia which each more effectively than words can be made available. For example, a satellite globe develops an understanding of the movement of various satellites in orbit and gives visual evidence of the different locations which are described in news bulletins. Scientific models of various kinds can also help develop concepts.
10. As new satellites reach out into space, under seas discoveries are reported, or historic events transpire at the United Nations, the need for access to current research findings and current materials which have significance for teaching in a particular field becomes more pressing. Some scientists are now saying that by the time material gets into book form it is already five to ten years out of date. Certainly the same thing is true of current history or government. A significant service of the materials center is development of files dealing with such current materials organized in such a way that their relevance to existing material in the curriculum can be determined.

The services suggested here are only a small part of those which can be made available. Each school system will need to develop its own unique pattern of service to teachers. St. Louis has its own radio station. Another school system employs a specialist in map making. Whatever the specifics, the instructional materials center should be designed as a part of planning for better teaching, and as a means of sharing teachers' ideas and plans.

This paper has dealt with the materials center for an entire school system. It is undoubtedly true that such a center has more to offer the teacher than a center developed for the building or even for the secondary schools alone. The reason for this is two fold. First of all, there is an added advantage in having the continuity provided by a staff which works with both elementary and

secondary school teachers. Second, the range of individual differences within the secondary school is even greater than that within the elementary school. If books, models, and other materials are to be selected to meet the maturity and ability of all students, those materials cannot properly be labeled for elementary or secondary or college students only. Often the American history teacher in the eleventh grade will find materials ordinarily used in the eighth grade to be pertinent to his needs. Similarly the fourth grade teacher may have need for materials usually used at the secondary level. Certainly any consideration of modern literature should include some children's books, for their literary quality is often superb. The materials center should have materials available in sufficient variety to meet the scope of any group of students.

It is important to have materials at every place of easy access for the secondary school. The classroom itself should make students want to reach out to say, "What is this?", or "I'd like to find out about this." The library of the individual school should have materials such as those which have been indicated in this paper. The central materials center should be an extension of both. It should have sufficient space and facilities and adequately trained personnel to supplement all phases of the secondary program. It should also have a planned program for increasing the richness of resources for the individual teacher in such a way that the teacher's job will be of higher quality without placing upon him an overwhelming burden of planning.

There is much wishful thinking on the part of many who seem unwilling to bear the costs of education that machines and various electronic devices may replace the teacher or reduce the number of teachers needed. This can be true only if teaching and education are narrowly defined as the dispensing of information. It is the conviction of this author that good teaching is far more than merely passing on information. Certainly this is a part of the teaching process. It is possible and desirable that new electronic devices and teaching machines may carry some of the information-dispensing roles of teaching. Used in relation to proper diagnosis of readiness for specific learning and followed with activity and discussion directed toward probing of ideas, they should rescue teachers from much of the routine of teaching and give them more opportunity to work with the development of ideas, for it is here that real teaching takes place.

Lets Look at the Systems Concept of Educational Planning!

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IN 1957, French teachers in four Detroit high schools were given a new system of instructional materials. At the end of one year, the students in their classes could speak French 50 per cent better than students in four other Detroit high schools taught by the customary textbook translation method. Students in the experimental classes also showed an 8 per cent better ability to understand the spoken language and were approximately equal to the traditional classes in ability to read and write the language.

It is always important when improved methods of instruction are found, but the development of this new French teaching program and the dramatic improvement in learning it made possible are of special interest. It is an example of the application of a *systems concept* of planning learning programs. Since all teaching involves a *system* of some sort, we are justified in asking "how is what is being called a *systems concept* a change from customary practices? And is it really a change?

There is evidence that the *systems concept* does represent a new emphasis in education—an emphasis on a broader basis for course development, and a degree of emphasis on the use of technological advances in communication which has not existed up to the present.

There are three basic characteristics of the *systems concept:*

First, it requires that the approach to instruction in any area of learning be in terms of an *ecology of education.* The term, *ecology,* is widely used in medicine, biology, and other life sciences to denote the study of the interrelationships of the organism with its total environment, both animate and inanimate. The ecological approach in education demands that subject areas be related to each other as fully as possible and that methods and materials used represent an application of the best knowledge about means of giving an individual the kinds of experiences most likely to result in desired learnings.

In practice, this requires that there be direct and continuous involvement in the planning process of persons highly qualified in

the many fields of special knowledge essential to the development of a complete system of instruction. This representation must include persons who have understanding in such areas as the psychology of learning, the subject matter to be learned, the other fields of knowledge that have important relationships to the primary subject field, and communications media and methods. The central purpose is to make all of education a systematic whole for learners. The contributions that can be made by anthropologists, sociologists, and psychologists, to name but a few of the broad field specialists who might be involved, are essential to the application of the *systems approach* in secondary schools.

A second characteristic of the *systems concept* is that it requires a detailed analysis of learning objectives specific to the subject field and the learners, the kinds of learning activties which must be carried on in order to gain these selected objectives, and methods and media which will enable learners to engage in appropriate learning activities. Such questions as these must be asked:

1. Who is to be taught what?
2. How can the learning process best be furthered by a consideration of (a) teaching-learning operations that an instructor can carry on; (b) learning operations that can best be accomplished through teacher-student interactions; (c) learning activities which can best be carried on by individual students; and (d) uses that can be made of modern methods of storing and presenting the substance of learning experiences through audiovisual techniques, and the printed word.

In an address given to the Institute of Radio Engineers on "Problems and Possibilities of Electronic Systems in Higher Education," Dr. C. R. Carpenter of Pennsylvania State University points out that "Educational institutions seem to have largely escaped technical modernization. They remain islands of archaic traditionalism in a social sea of modern technology. Consider, if you will, the engineering professor teaching servo mechanisms in the manner of a medieval monk, except that he may use a chalkboard! Is it possible to construct a new conceptual model of teaching and learning? Can such a model be conceived objectively, operationally, and functionally, without being cluttered, encrusted, and impeded by the mysticism, ritualism, and irrationality of traditionalism?"

Dr. Carpenter goes on to name in detail the kinds of instructional operations that teachers can carry on, and the mediating

operations that can be performed through a communications network in selecting, collecting, storing, retrieving, and presenting the audiovisual and verbal elements of many kinds of learning experiences. He describes also the operations and conditions of learning of students. In a detailed analysis in these three areas, Dr. Carpenter states that some teaching-learning operations are specific to the teacher and cannot be mediated by information presenting and testing devices. Other functions are specific to teacher-student interactions and cannot be mediated as now conceived. A third group of operations are those which are specifically a responsibility of individual students, as for example, the creative use of information in developing a composition or report. However, there are numerous teaching-learning experiences which can be presented effectively through the use of audiovisual devices, auto-instructional systems of the teaching machines type, and learning laboratories of the language lab type.

A third characteristic of the *system concept* is that required learning resources must be secured and/or produced, and organized into a system which makes it possible for learners to engage in activities required to reach selected learning objectives. This calls for experimental development of a system, appraisal of its use, and redesign of the system until learning gains satisfactory to the planning team are reached consistently.

How does the approach suggested by this *systems approach* differ from what is usually done today? Let's examine the situation.

First, is the planning of most secondary school courses being done by teams broadly representative of many fields of knowledge? Almost never! The planning of secondary school courses is usually carried on by subject field specialists who jealously guard their authority to determine what is to be taught and how it is to be taught. Even when a team approach is used in planning courses, it is customary for all members of the team to represent the same subject field. Textbook writers are subject field specialists and their work is reviewed by specialists in the same field.

Second, do we usually find an organized effort to make a truly thorough analysis of the role of learners, instructors, and educational media in a learning program? Most efforts of this type stop at broad statements of learning objectives. Follow-through is almost invariably on a piecemeal basis. It usually involves use of a narrow spectrum of learning experiences, commonly presented

through the pages of a single text or through the use of a scattered variety of the materials made available to teachers on a catch-as-catch-can basis.

Third, are there many instances in which learning resources have been selected and produced as complete learning systems in which the special strengths of various types of media are used to best advantage? Practically none! Traditionally, course materials are produced by commercial organizations that specialize in the publication or production of one media, such as texts or films.

A review of the way in which the French teaching program used by the Detroit schools was developed shows how the *systems concept* is evolving through efforts to find more effective ways of teaching. Six years ago, representatives of eight large universities and the Detroit schools joined forces in an effort to improve foreign language instruction and organized the Modern Language Audio-Visual Project. Without consciously planning from the beginning to do so, their efforts to improve instruction led the group to move increasingly in the direction of the *systems approach*.

First, the methods and materials used were developed by a team of experts representing specialists in French language teaching, structural linguistics, psychology of learning, testing and measurement, sociology and anthropology, and educational media. Not all specialists were involved at the very start of the Project, however. First one and then another was drawn into the planning group and became personally concerned with the contributions that his area of specialization could make to the undertaking. The existence of different points of view representing thinking in different areas of specialization forced the entire group to make a constant examination and re-examination of what they were doing. New dimensions of importance in the subject field itself became apparent. One member of the team, a structural linguist, suddenly pounded the table during one of the planning sessions and exclaimed, "By God! This matter of foreign language teaching is just too damned important to leave to foreign language teachers!"—and the foreign language teachers in the group were the first to agree that he had hit the nail on the head.

Second, the study grew out of evidence that existing methods were not achieving important objectives of language instruction. The planning process involved the selection of desirable objectives and a continuing analysis of the role of students, the responsibilities of instructors, and the methods and media that offered the greatest

promise for reaching planned objectives. It was obvious from the beginning that two of the chief objectives of good foreign language instruction, namely, understanding and speaking the language, were largely ignored by traditional translation methods of teaching. Effective ways had to be found to enable students to hear the language spoken by a variety of native voices. Furthermore, languages had to be heard in a context of rich visual meaning so that the streams of sound would have the meanings that they had to have because what was heard was inherently related to what was seen. It was also essential that students be given greatly increased opportunities to practice their own voicing of these sounds.

Out of this study came a complete revision of language laboratory methods which placed stress on immediate hear-back as a means of giving students instantaneous self-monitoring of their practice speaking. Out of it also came an emphasis on audiovisual materials as a means of bringing highly faithful representations of the French culture and language into the classroom.

Third, all of the selected component methods and materials were combined in an experimental system. Most materials had to be developed from scratch. An integrated plan for subject matter presentation was developed and refined. Audiovisual materials were produced in France. This development took place over a period of approximately four years while constant revisions were made in component parts of the system.

This approach toward the planning of a teaching program involved a breadth of viewpoint, a degree of planning, and an application of varied methods and media not characteristic of the limited efforts to improve language teaching which were taking place.

There are other promising movements in the field of secondary education toward the application of the *systems concept* in the planning of course materials. Some of these are illustrated by the development of new programs in physics, chemistry, and biology under the direction of a team of scholars at the Massachusetts Institute of Technology. At Yale University, a team is developing new approaches to the teaching of mathematics. Glastonbury, Connecticut, is serving as the coordinating center for an extremely ambitious foreign language materials development project.

The merit of programs such as these will unquestionably lead to their wide acceptance and to acceptance of the importance of a *systems approach*. However, this acceptance will be wider and faster if there is recognition of the nature of the roadblocks to

development of a *systems concept*. One of these roadblocks is the fact that responsibility for determining what is to be taught in a specific field is monopolized by subject field specialists. Too often, these specialists develop an aristocracy in which teaching methods and materials acquire sanctity from long acceptance. The traditional compartmentalization of subject fields in secondary education tends to perpetuate this kind of monopoly.

At the college level, the *general education movement*, which has gained increased momentum over the past ten years, has done much to promote an examination of educational purposes in every subject field and has moved in the direction of a *systems approach* to the planning of instructional program. In the secondary schools, the *core curriculum* movement has been battering at the high walls of compartmentalized subject fields for years with slow but increasing effect. During the last few months, the report of the Commission on the Experimental Study of the Utilization of the Staff in the Secondary Schools of the National Association of Secondary School Principals, commonly known as the Trump Study, has suggested that consideration be given to the need for reorganization of secondary school programs. This movement can do much to promote use of a *systems approach* in planning learning experiences.

A second barrier to acceptance of the *systems concept* is the too prevalent view among educators that applications of technology will mechanize and dehumanize education. One staff member indicated his narrowness of viewpoint and his degree of emotional concern by exclaiming angrily, "When I can't teach better than any damn tape recorder, I'll resign!" This attitude is responsible for the opposition to the kind of technical modernization to which Dr. Carpenter refers. Much of this problem arises from the fact that many of the most promising developments in the technology of information storage and use have come into general existence since the great majority of all teachers received their professional training. This barrier can be removed only when all teachers are given a thorough opportunity to become familiar with the new devices.

A third barrier is the fact that almost all commercial publishers and producers of educational materials are specialists in the production of only one type of media. These organizations feel themselves in competition with each other. Until they find that their materials are not being accepted, they are not likely to cooperate in the production of integrated systems of learning materials or even broaden their scope of production to include varied types of materials.

A fourth barrier is the relatively high cost involved in developing an entire system of learning materials. It is one thing to finance the production of a single textbook or isolated films and quite another to underwrite the cost of production for a complete system of materials which could require several printed documents of textbook length, 20 to 40 motion pictures of varying lengths, numerous sound filmstrips, from 20 to 40 lessons programmed for use in teaching machines or as *programmed* texts, numerous tape or disc recordings, and a teachers' guide. Entirely apart from the production expense involves, the cost of bringing together highly qualified groups of specialists for work over long periods of time plus the cost of engaging in extended experimental use, evaluation, and redesign of the system could be considerable.

A fifth barrier is the cost of purchasing all of the materials which might be required to install a new system of instruction. Such materials for a single high school course could range in cost from $1,500 to $15,000, depending upon the nature of the course and the completeness with which learning experiences are audiovisualized or otherwise presented. When school officials are accustomed to buying all of the texts that they may need for a single class of 35 students for approximately from $100 to $150, or when they have customarily required high school students to buy their own texts, they are slow to accept the idea that instructional materials for a single class might cost one or more thousands of dollars.

Finally, opposition on the part of some educators to the *systems concept* arises from the words themselves. For some persons, the term has a connotation of something fixed and inflexible. Their general reaction is "But we don't want a rigid system of instruction! This is what we've been trying to get away from." In actual fact, the phrase, "systems concept," is used in the sense of "planned organization." A system does not have to be rigid. It can be as flexible as the needs of a good learning situation demand. It can include definite planning to obtain all the freedom for learners that learning objectives require. This is not ruled out because attention is focused on the importance of planning with a degree of totality extremely rare today. It is a name for a *process* rather than a limited descriptive phrase, such as "Winnetka Plan" or "Dalton Plan" or even "core curriculum." This emphasis upon a broadly conceived *process* can have the advantage of keeping new developments from developing a provincialism all their own.

Television and In-Service Education

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THE ROLE that television is to play in programs of in-service education is still being explored, as are its other roles. But school systems in urban areas in particular have been quick to see the possibility of making use of this medium for reaching teachers. In 1956, for example, teachers in St. Louis County received a series of three late afternoon telecasts, each 15 minutes in length, that made suggestions for the best use of other telecasts to be received in their classrooms.[1] By the same date, the Houston Public Schools had already had considerable experience in sending programs after three o'clock to elementary school faculties in their buildings on such diverse topics as the healthful school day and teaching third grade arithmetic.[2]

More recently many school systems have begun to sense the value of television for in-service education. What some of these programs look like may lead us toward a definition of the problems in and possibilities of adding this new instrument to our program of professional growth experiences for secondary school teachers.

SOME CURRENT PROGRAMS

The examples to be described here, as will be evident, are drawn from both elementary and secondary education. However, the underlying approach in most cases seems appropriate to either level. Also, there is no attempt here to represent the entire field. What is hoped for is that these brief accounts may provide material that will give the later discussion more body.

The best-known televised in-service programs are those in physics and chemistry produced by Continental Classroom. Early-rising science teachers have had an opportunity to bring their content knowledge up to date by this means. They have also been able to gain college hours for their "attendance" by registering with one of the many institutions that agreed to certify the course for credit. The two series have been notable on several counts—the national thinking that gave rise to them, the financing of the programs by

[1] Lee E. Campion, "The Teacher Trains the Teacher," *Educational Screen and Audio-Visual Guide* 35 (November, 1956), 410-11.
[2] Harold E. Wigren, "Television: A Challenge to the Elementary Schools," *National Elementary Principal* 35 (September, 1956), 212-224.

foundations and industry, the showing of the programs on commercial networks, and, of course, the planning that went into the choice of content for the courses.

Two new content-centered television courses are projected for the 1960-61 school year by the Board of Education of New York City and the Regents Educational Television Project.[2] One is designed to improve the teaching of elementary school science; the other deals with secondary school English. Each series will run for 29 weeks. Both combine weekly half-hour television lectures with "live" workshops. To be telecast at 3:00 p.m., the programs will be received in various centers throughout the city, at which teachers enrolled will meet to see and discuss the lectures. Also, the series will be filmed for use in other parts of the state and possibly elsewhere. Notable in this example is the combination of television with regular course activity.

Another in-school venture in in-service education has just been completed by the Center for School Experimentation, College of Education, The Ohio State University.[4] However, in this instance the emphasis was on methodology rather than on content. Through a series of 10 half-hour telecasts sent out to 150 third- and fourth-grade classrooms in the Columbus, Ohio area at two-week intervals, an attempt was made to achieve two purposes. The first was to stimulate pupil interest in the topic being presented—weather, electricity, and so on. The other was to underline for teachers the various ways in which science can be learned. Entitled "How Can We Find Out?" the series offered suggestions for answering questions by observing, experimenting, recording, and other like activities. Teachers in the project were fully aware of the double purpose, assisted in choosing topics, and cooperated in continuous evaluation of the effectiveness of the series. Here is an example of programs planned to capitalize directly on the conclusion often reached by school producers that the greatest benefactor of good classroom television programs is the teacher.

Again, these few examples of current or projected uses of television for in-service education are not to be regarded as representing all the present uses and certainly are not offered as the best that might be found in a comprehensive survey of what is now going on. They may, however, suggest some of the major problems to be faced.

[2] From an article headed, "City Will Use TV to Train Teachers," *New York Times*, June 24, 1960; pages 29-30.

[4] Project 298 financed by the U. S. Office of Education under Title VII of the National Defense Education Act.

PROBLEMS IN THIS USE OF TELEVISION

The purpose of defining the list of problems to follow is to alert ourselves to the need for exercising our best professional thinking about the role of the television when we add it to our program of in-service education. Basically, the question is whether we use television to enrich our program or whether it can be misused to diminish what we hope to do.

Impersonality of the medium. Obviously, the same qualification on the use of television in in-service programs that is made on its use in the classroom has to be acknowledged—the remoteness and inaccessibility of the persons on the program.[5] Even though the program may originate only a few miles away, its distance psychologically may seem very great simply because there is no way to interact with the message. Now interaction is not always necessary. Messages can still carry weight without it. But in professional activities the provision of opportunity to work things out together with those in positions of official authority has seemed essential.

Another aspect of the impersonality of the medium is the tendency for television programs to get themselves filmed for repeated use. Thus, a good program designed to help induct new teachers might be used for several years quite satisfactorily—but also quite without the kind of interaction that even in a large-group meeting, as laughter or applause, may do something to establish warmth and a feeling of being in this business together.

Narrowness of probable use. We tend to use television as a vehicle for program series. This may be partly due to our own rather limited experience with the medium. But it may come in part from the station's need to project programming ahead and to "fill up the air." All of the examples we have given are designed as series, ranging in length from 10 programs to enough to cover a year.

Allowing for the impersonality that goes with televised programs, such "courses" may well be an important part of our in-service program. But we would certainly hope that there would be much more. The cost in time and money that goes into preparing a television series is something that has to be weighed against the possible loss of these resources to other activities.

"Invasion" of professional privacy. We like to think that a modern program of supervision and curriculum development is

[5] See Finette P. Foshay, ed., *Interaction in Learning: Implications for Television* (Washington: Division of Audio-Visual Instructional Service, National Education Association, 1959).

based on a high level of professional responsibility. We have come to think that teachers should participate in and to a large extent determine how they will be involved in in-service activities.

The use of television, particularly within the school day, may in some cases cause us to wonder whether there is not a kind of "invasion" of professional privacy. Of the programs here described, the one from the Center for School Experimentation may represent this possibility most clearly. In this particular experience, teachers did volunteer to take part and knew what was being attempted. But there may still be a question of whether this kind of classroom-centered in-service aid could get in the way of the teacher's working with his own students as he sees best.

Centralization of program planning. Because television is a mass medium, the movement is toward centralized planning. The cost of high-level programming and the prospect of off-setting the cost by wide distribution support this movement. Thus, we have programs planned at the national level in Continental Classroom, others planned for state use in the New York City program, some planned to cover a six-state area, and a coverage of three counties in the Ohio experiment.

We need to be on guard against the possible restrictions that such centralization may place on local programs of in-service education. The quality of the telecasts may be excellent, perhaps far better than could be prepared locally. Yet if we relinquish responsibility for deciding what our own needs are or if we put the larger part of our in-service budget into sharing the televised product to be "bought" from some place else, we may undercut our best convictions about the wisdom of local assessment.

In most cases, these "problems" in the use of television are problems only because we permit them to be. Most of the potential shortcomings can be controlled if we choose to do so. We may grant the impersonality of the medium and thus use it only as this factor does not interfere with our purposes. We may understand the narrowness of its use and thus compensate by other types of activities. We may question the ethics of trying to educate the teacher in the classroom along with his students and try to guard against unprofessional pressure. Recognizing that centralization may provide us with some riches that we cannot secure alone, we can still use "outside" programs but control closely the extent to which we come to rely on their help.

However, we do need to be alert to the nature of the medium with which we are dealing, the tendency it has to run to high cost

in money, energy, and time and the consequent drive toward securing the largest possible audience for its product. With such understanding, we should be able to derive from television some new possibilities that can enrich rather than impoverish our in-service programs.

POSSIBILITIES FOR ITS USE

In a sense, as we define possibilities for the wise use of television, we shall be looking at the same phenomena through other eyes.[6] In this case, we are assuming that we are in full control of the extent to which we are to use television and are keeping in mind also the full range of activities that comprise a good in-service program.

Increase in range of resources. To the extent that television brings to the local scene experiences of value that could not otherwise be afforded, it does promise to increase the range of resources. Some of these may be produced nationally or regionally and then selected by local communities for their own use. One of the issues in the development of such resources may be the extent to which the right to select is maintained by local school systems.

One can also imagine the possibility of area or regional committees planning to make much more widely available the services of visiting authorities on specific topics, with the cooperating schools underwriting the cost. Similarly, the planning of in-service courses, where these are appropriate, might be much better based if several school systems went together to draw for resources on all the institutions of higher learning among them rather than for each to rely on local colleges only.

Multiplication of existing resources. Most school districts feel they cannot afford all the supervisory or consultant help they would like. If properly designed, television programs could bring certain kinds of services to teachers or teacher groups.

For example, a city, county, or state supervisor of foreign languages might arrange a series of monthly programs showing varied ways to make use of the new language laboratories that are being installed in so many high schools. Or someone similarly placed but representing mathematics might bring to the television studio teachers who have had unusual success in incorporating new content in their courses. Trying to make sure that all teachers

[6] In developing these ideas, the writer is indebted to *Television in Instruction: An Appraisal* (Washington: Department of Audio-Visual Instruction, National Education Association, 1958), a report of a conference coordinated by Harold E. Wigren.

could have such experiences directly would overburden the supervisor, but could be done easily by television.

Greater economy of effort. As we pointed out in the beginning and as is clear in the other illustrations, the development of televised in-service program seems particularly attractive to urban areas. The reduction in travel is a great boon. Teachers can listen in a room provided at school or in a neighboring center, or even at home if the program is telecast in the later afternoon or evening hours.

If the resources to be made use of are drawn from a larger area, the same reduction of effort would be in the picture in other than urban areas. Instead of having to attend a regional or state meeting, teachers could receive the same or similar messages back home. This virtue of the medium may prove one of its most attractive features to teachers.

Enlargement of common experiences. Just because it is a mass medium, television can be used with great effectiveness to provide common experiences. For example, some school systems are so large that getting all teachers together in one meeting is either impossible or becomes so unwieldy that teachers may never have a chance to receive the same message in common. When doing so is desirable, as it well may be when official proceedings related to program, salary, and other such matters are involved, television can reach all teachers simultaneously. It becomes then the vehicle for the kind of immediate communication on which we place so high a value in our out-of-school lives.

Also, there are other kinds of total-group experiences, inspirational or informational, that could possibly contribute to the better formulation of common goals. Using certain programs as a base, each faculty or department concerned might well move ahead to adapt the material to local needs. Conceivably the common base might help to insure a higher quality of education.

These, then, are some of the possibilities in the medium that could contribute to a better in-service program. In conclusion, we may agree, first, that no new instrument or resource is going to do more for us than we are ready to have it do. If we have a good program of in-service education, television may be useful in enlarging its effectiveness. If our program is one-sided or poorly planned, television will not rescue us.

Launching a Language Laboratory and Its Program

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SCHOOL administrators and language teachers across the country are frantically searching for information about language laboratories. Great claims are heard in favor of this new teaching tool, and federal funds are available to assist school systems in the installation of anything from a modest "starter" lab to a completely equipped one. The phrase "We have the money—what shall we get?" is all too familiar to this writer. The best answer we can give goes something like this: Get some standard commercial tape recorders (enough so that each student in a given class or section will have his own during a lab hour if possible), plenty of tape, microphones, and headphones. Along with this you will need some very simple wiring to patch the tape recorders together for purposes of copying individual tapes for your students. If funds are still available, install booths, monitoring facilities, acoustical materials, and some of the other trimmings, but keep in mind that the latter are *not* absolutely essential. The real essential to every language laboratory is a plan of action. Before you purchase any equipment, *decide what you are going to do with it!*

The language laboratory *program* is far more important than the laboratory itself. If the language teacher wishes to record sections of the traditional textbook and play them to large groups of students, he does not need a language laboratory. He needs only one tape recorder on a table at the front of his classroom. His students can listen to his tape through the loudspeaker of the single machine (or through a better speaker, if possible). They will derive the same benefits from such listening as they would if they were all listening through headphones. The teacher may be thinking in terms of offering his langauge course on a "conversational" basis through the medium of the language laboratory. He will find *any* kind of a laboratory installation quite inadequate for this, since a tape recorder is not capable of carrying on a very intelligent conversation. For what kind of program *will* the language lab do a good job? For the program which aims to teach the student a language *through its spoken forms!*

Every language teaching has heard his friends, colleagues, and particularly his students' parents make such statements as "I took two years of a language in school, but they never taught me to speak it." Such complaints are not wholly justifiable since "they," who never taught this person to speak a language, had neither the linguistic knowledge nor the electronic and mechanical equipment which are available to us today. "They" had only the textbook with its *written* forms, and, try as they might to give oral emphasis to a course, when the class hour was over the only homework they could assign for the next day consisted of printed words on the pages of the book. Thinking in terms of the findings with which linguistic scientists are assisting us today and in terms of the types of equipment available to us, let us do some very rudimentary course planning and laboratory planning. It is our sincere hope that some language teachers will become intrigued enough with some of the following ideas that they will wish to carry these thoughts beyond the rudimentary stages with cautious, intelligent planning, and the will to do a great deal of hard work in setting up an effective laboratory program.

First, what can *we* do in teaching a foreign language today which "they" evidently could not do for the person who "took" a language but never learned to speak it? The best thing we can do is to present the second language to our students in terms of its behavior when it is *spoken*, not in terms of its *written* grammar. Do these two languages (written and spoken) really differ a great deal? Is it unrealistic to teach the written language and expect the student to learn to pronounce it reasonably well as we do so? The answer to both questions is "yes" for many languages including the one in which this article is written.

Let us look at an example, supposing that we are teaching English as a *spoken* language to a foreign-born student. We arrive at the presentation of the simple past tense of English verbs. Without allowing the student to see the written English forms, we say a sentence, first in the present and then in the past, hoping that he will observe the change which takes place: "I tap my pencil on the table"/"I tap*ped* my pencil on the table." If the student has a good ear, he concludes that the simple past tense of this particular verb is formed by the addition of a "t" sound to the present tense: "tap" /"tap (t)". If we had presented the problem by telling the student that this verb forms its past tense by doubling the "p" and adding "-ed", we should have done him a great disservice, since neither the

"p", nor the "e", nor the "d" is pronounced. We may then conclude from this simple example (and countless similar ones in English) that the spoken and written forms are different for many languages, and that the student probably would have encountered some difficulty in pronouncing "tapped" had he had to translate the written representation ("-ped") into the spoken one ("-t"). We may further conclude that we must teach our students to say and comprehend "tap"/"tap (t)" before we allow them to see and write "tap"/"tapped". Our final conclusion might be that there must be other verbs which form their past tense as "tap" does, and we could structure a language lesson so that it presents all verbs of this type. Such structuring will assist the student immeasurably in making him hear and say a pattern which we want him to establish as a speech *automatism*.

At this point, the reader may well ask: "Isn't this exactly the way small children learn their native language?" The answer is *NO*. It is true that small children learn "tap"/"tap (t)" before they are ever exposed to its written forms in the first grade. It is also true, however, that they have *thousands* of hours in which to learn spoken forms before being exposed to written representations (the high-school language student may have from 150 to 250 hours in a school year!). Since small children have so much time to "study" and so many good models to imitate, no structuring of material is necessary. Furthermore, the first-grade teacher need have no fear that little Mary is going to start saying "tap"/"tap*ped*" as soon as she sees "-ped's", for Mary will long since have learned the correct pronunciation through hundreds of repetitions and associations. Her pronunciation habits will be so firmly established in the spoken forms of the past tense that not even our illogical spelling system will harm them.

How should the lesson material be structured to render the student's task as reasonable as possible? Returning to our example of the English past tense, we might present three categories of verbs for class and laboratory study: Verbs whose spoken forms end in:

a) "t" sound:	b) a "d" sound:	c) an "ed" sound:
tap/tap (t)	please/please (d)	attend/attend (əd)
stop/stop (t)	raise/raise (d)	roast/roast (əd)
pick/pick (t)	arrive/arrive (d)	land/land (əd)
crack/crack (t)	lengthen/lengthen (d)	perfect/perfect (əd)

The reader can see at a glance that the above categories take in an immense number of English verbs even though they do not include irregulars such as "buy"/"bought", "go"/"went", etc.

Lest the teacher fear that it may become his task to structure the foreign language which he teaches according to the examples given, let us hasten to say that such structured materials are being created for him and that some are now available to him, thanks to linguistic research. The important point is that the teacher begins to think of such a realistic presentation of language if he wishes to answer the demands made on our profession today and to justify the expenditure of a considerable sum of money for the installation of electronic equipment.

Now let us see where equipment fits into the picture. Suppose that a teacher presents a carefully structured language lesson based on *spoken* forms. Unless some sort of record/playback equipment is available, the textbook (i.e., *written* forms) remains the only means of review of what the student has learned orally in class. We need to elaborate no further on the dangers of allowing this to happen. What kind of audio device does the student need for reviewing the work done in the classroom? Basically, he needs nothing more than a standard half-track tape recorder such as we find in many American homes today. Such a machine can drill the student on the spoken forms of the lesson material, confirming or correcting his responses with correct answers following the linguistic problems posed on the tape. It will lose neither its voice nor its patience if the student makes it repeat a given word or phrase several times until he understands it. What is most important is that the machine can drill the student until he begins to develop *automatic* responses to the carefully patterned linguistic stimuli which the tape should present.

The reader will note that we have made no mention of the student recording his own voice in the procedure described above. It seems to be a widely accepted fact that recording along with a lesson tape is costly, time-consuming, and not very profitable. Most beginning language students are not capable of hearing their own errors (in grammar *or* pronunciation) when they play them back after making a recording. If they are capable of hearing them, they frequently do not know how to correct them. The machine which the student uses, however, should be a recorder as well as a playback machine so that the student can use it for taking oral *tests* on which he records his answers.

It will also be noted that we have not yet used the term "language laboratory" in discussing the equipment which the student needs for reviewing spoken grammar. If each student's home were equipped with a tape recorder, and if each student had his own copy of the current lesson tape, his review work could be *home*work in the literal sense of the word. Because the tape recorder is not yet such a common appliance in the American home, however, and because of the need of testing audio-lingual progress, the school needs some form of language laboratory.

Let us suppose that the school budget does not yet provide for a completely equipped laboratory with all of the trimmings. The kind of beginning laboratory which the school can install in such circumstances (and perhaps *should* install, experimentally, in *any* circumstances) has already been described in our opening paragraph. Given eleven tape recorders, for example, and a few tables along one or two walls of a classroom, homeroom, study hall, or library, the teacher can prepare tapes based on lesson material, and students can do their audio-lingual review work at school. Each tape recorder is provided with headphones (which short out the loudspeaker) and with a microphone which enables the student a) to hear himself in his headphones as he speaks and b) to record his answers for laboratory tests. A simple arrangement of wiring makes it possible for the teacher to make ten simultaneous copies of each lesson tape by feeding it from one of the eleven machines to the other ten.

Many experienced people in the language laboratory field would lead us to believe that instead of individual equipment and tapes for each student, only a few tape recorders are needed. Each can be wired to several sets of headphones or listening booths. Such an installation would certainly be less expensive than the one we advocate. We would, however, question the effectiveness of such an approach to teaching spoken forms. If a language teacher asked ten students to open their books to the same page and to start studying the *written* aspects of a given lesson at the same moment, all ten would soon be on different parts of the same lesson. Some might even skip over several parts at the very outset, going directly to the material on which they felt the greatest need to concentrate their efforts. This observation is not surprising. How realistic is it then to ask the same ten students, whose talents and needs are just as varied in terms of spoken forms, to listen together to *one tape*?

How much time should students spend on a language tape, and how can one schedule this time? Ideally, each student should be able to take as much time as he *needs* for study of a given taped lesson, and he should be able to go to the language laboratory for independent listening just as he goes to the library for independent reading. On these points, however, we must face the facts of scheduling and supervision which face the high-school language teacher. It will probably be necessary to schedule classes or sections to work in the laboratory as groups. *Group scheduling*, we might add, does not eliminate the possibility (and desirability) of *individual study* (i.e., a tape for each student). Incidentally, a teacher will probably have to be in charge of the laboratory whenever students are present. In other words, the laboratory neither lightens the teacher's load nor replaces him. It must be considered (by administrators and by teachers) a teaching tool of great potential well worth the extra effort required of the teacher.

If we present spoken forms as the backbone of our language course, we must test our students on their knowledge of the spoken (as well as the written) forms. The type of laboratory which we have described can serve as an excellent testing device. The teacher prepares a test tape consisting of ten or fifteen problem sentences, each followed by a pause. This tape is played from one machine to all of the others as in the copying process which we have described. The student, seated at his tape recorder, hears the first test question in his headphones. During the pause which follows this question, he starts his tape, records his answer, and then stops his tape. Each student goes through this process of starting, answering, and stopping until the end of the test. The teacher then collects the students' tapes for correction and grading. He will soon find that the correction of these tapes (which do not contain his test *questions*) requires little more time than the correction of a set of written tests of comparable length.

In conclusion and in summary, may we urge the language teacher to select or to construct his materials and to plan his program *before* investing in expensive equipment, to gear his teaching to spoken forms, to select simple equipment (enough for each student if possible), and to test the student's knowledge of spoken forms as frequently as his knowledge of written forms. Finally, may we remind the teacher that although the language laboratory will probably not prove to be a labor-saving device, it would be difficult to find a substitute for it in the role it can play as a tireless drillmaster of spoken language.

Programmed Self-Instruction: Possibilities and Limitations

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THE accelerating interest in programmed self-instructional materials and "teaching machines" may be attributed to several developments impinging on the instructional process. These developments represent stern realities which educators face in the years ahead. They include mounting school enrollments, a continuing teacher shortage, and the vast amount of accumulating knowledge which, especially in the physical sciences, is expanding at a dramatic rate. In addition, the international race for intellectual supremacy has brought a growing realization that development of the full potential of *all* American youth is now an urgent national imperative.

Attempts to solve the "quantity-quality" problem have led to inquiries into two instructional approaches utilizing new educational media: Motion picture and televised instruction can offer superior teaching to a large number of students at the same time; whereas programmed self-instructional methods provide the individual student with a learning sequence which is under his control.

Programmed self-instruction as a method of teaching verbal material possesses the following characteristics:

1. A question or problem is presented to the student either by a card or printed sheet seen through a window or by a film projected on a reading screen.
2. The student records his answer. In some machines he makes a selection from a number of alternative answers; in others he writes out an answer he has constructed.
3. The student obtains a check on the accuracy of his answer as soon as he records it.
4. The timing of the questions and answers is usually under the control of the student, who proceeds at his own pace.

NATURE OF TEACHING MACHINES

The teaching "machines" vary considerably in size, complexity, and format. Some are simple paper cards or programmed textbooks; others are crude mechanical devices about the size of a

record player. Still others are much larger and come equipped with electronic circuits to store up details of the learner's performance. Most of the research in testing the effectiveness of the machines has been limited to small-scale laboratory studies utilizing simple mechanical devices.

The heart of programmed self-instruction is not the device used to present the material, but the instructional sequence, or "program." A teaching machine program is a preordered sequence of material which builds on what has gone before—much like a musical composition. The programmed material controls the behavior of the learner as he masters each succeeding and increasingly complex segment of the subject matter. The devices, whether mechanical or electro-mechanical, serve motivational purposes; they also pace the student in accordance with his learning speed, and prevent premature access to the answers.

It should be noted that programmed self-instructional materials cannot be improvised. They must be constructed by someone who is familiar with the subject matter and knows something about learning behavior. The construction of programs consumes a great deal of time since the editor of the program is the student himself and the material must be continually revised as students use it and, by their responses, help the programmer identify its weaknesses. At this stage of the teaching machine movement, a program is a work of art; artisans are few, and only a handful of full-blown programs that profess to cover any major segment of a subject have been constructed.[1]

The two main types of teaching machine programs are the constructed answer based on B. F. Skinner's principle of immediate reinforcement of responses; and the multiple choice type which stems from S. L. Pressey's pioneer work on teaching machines. Although this dichotomy is somewhat oversimplified in view of the variety of programs and devices now available, it will serve to point up the direction of current programming techniques.

The "write-in" machine employs printed material which is fed past two windows in the machine by a unidirectional drive mechanism. The student responds to a question by writing his answer on paper exposed through the nearer open window. He then operates a lever which moves the written response to the farther window under glass and exposes the correct answer in the open window. The

[1] Eugene Galanter, "The Mechanization of Teaching," *The Bulletin of the National Association of Secondary School Principals* (April 1960).

student at this point compares his answer with the correct answer, scores himself "right" or "wrong," moves the lever to bring up the next item, and repeats the process.

An example of a multiple choice "teaching machine" is the so-called "scrambled book." The student finds the first unit of information and the first multiple choice question on page one of the book. Each of the alternative answers to the question asked is identified by a different page number. The page to which the student is referred, basd on his selection, discusses the answer, and then either poses a new problem incorporating the learned material, or refers the students back for another try if the answer was wrong. The items and answers are deliberately not in the same order as the numbered pages, so that it is not possible for the student to skim through a book looking for the answers. This method permits the student to progress through the book by eventually choosing the right answer to each question.

A more complex machine of the multiple choice type, an automatic microfilm projector, comes equipped with pushbuttons which, in effect, turn the pages for the student. The device can be fitted with a recording mechanism to recover a complete record of the student's progress.

POSSIBILITIES

Proponents of programmed self-instruction maintain that this is not a new method of teaching; the basic procedure is found as far back as the Socratic dialogue. What is new, they say, is the development of a science and a technology based on a method employed by the great teachers of the past. Thus, some aspects of the art of teaching may become a part of the science of learning through programmed self-instruction.

Theoretically, the mechanical tutors represent labor-saving devices for the teacher since the self-instructional techniques are tailored to the learning speed of the individual student. This method provides the student with as much practice as he needs, permits the rapid learner to cover the material quickly and the slower student to proceed at his own pace. As a consequence, the classroom teacher may be freed from the burdensome and time-consuming tasks of *presenting* material and taking precious class time to repeat material for students who didn't get it the first time.

Advocates of self-instructional techniques further maintain that

this method may be adapted to home study and can save the teacher from devoting time to the correction of individual assignments. Self-correcting homework materials, it may be noted, have been prepared in high school English by Educational Testing Service.[2] Self-instructional materials may also be used by temporarily homebound students who may keep up with assignments while unable to attend regularly scheduled classes. In addition, some propose that programmed materials may be used in small high schools with limited curriculum offerings to meet the needs of students who request courses not included in the school program.

Students working with self-instructional materials will be enabled to work privately and independently and, as a consequence, recognize the fruits of their own labor. It is contended that this will result in a lessening of invidious comparisons of their achievements with that of their classmates.

According to Simon Ramo, in the high school of the future there will still be human teachers and classroom sessions, but each student will spend a large proportion of each day interacting with computer-controlled teaching machines. The machines will tutor the student, schedule the curriculum to suit his individual abilities, and provide his human teachers with a detailed description of his academic strengths and weaknesses. Ramo foresees the need for highly skilled teachers who can work closely with subject matter specialists and "teaching engineers" in modifying and revising the teaching devices and programs.[3]

LIMITATIONS

There are now dozens of different types of devices that could be classified as teaching machines, most of which represent minor variations of two, or at best, three or four basic designs. At present, good problem materials to be used with teaching machines, and procedures and principles for the preparation of such materials have not kept pace with the development of the devices themselves. There is a lack of extensive empirical data on the effectiveness of this method of teaching. Despite some favorable findings of research in self-instructional techniques, there is little evidence on the factors that make that particular machine design or set of instructional items effective. There is much to be learned about

[2] Paul B. Diederich, "The Rutgers Plan for Cutting Class Size in Two," *The English Journal*, Vol. 49, No. 4 (April 1960).
[3] Simon Ramo, "A New Technique of Education," *Engineering and Science*, Vol. 21 (October 1957).

the preparation of good items, and there are hardly any criteria to determine whether the items in a program are "good."

Another limitation is that the selection of a particular teaching machine places severe limitations on the type of variables the researcher can investigate. Teaching machines, for the most part, are single-purpose devices with limited adaptability. Thus, it is possible for the machine to dictate the direction of research, whereas, ideally, research considerations should direct the development of the machine.

Another problem in reference to the inflexibility of programmed self-instructional methods is that a particular program may not be optimally effective for all members of a typical class. Students, after all, differ in both experience and in inherent ability, or "intelligence." An "ideal" sequence of items for one student may be less effective for some other student.

Teaching machines present items in an essentially predetermined sequence, permit the student to respond, and give him immediate feedback. But does the fact that a student is shown the correct answer, or selects the correct answer after several attempts, insure that he has actually acquired knowledge? The machine does not "know" whether the student has mastered the material the way a human instructor may know through observation and questioning.

Professor Skinner, for example, insists that a student through machine instruction will be enabled to proceed at his own level, advancing as rapidly as he can. Under these conditions, he says, the conventional grading system will have to be overhauled since a grade will be useful only in showing *how far* a student has gone. Thus, a "C" might mean that he is halfway through a course. Given enough time, says Skinner, he can achieve an "A."

In challenging Skinner's point of view, one psychologist calls attention to the question of transfer and cites studies on overlearning which tend to show that performance may not mirror how much has been learned. He questions whether the completion of a programmed course is the final criterion of learning.[4]

Other limitations of programmed instruction include the large expenditure of money, the great amount of time, and the application of special skills necessary to produce a program; the difficulty of determining the specific body of knowledge to be programmed; and the fact that the method lacks a philosophy of application in the instructional process.

[4] Howard H. Kendler, "Teaching Machines and Psychological Theory" in Eugene Galanter (ed.) *Automatic Teaching: The State of the Art*, John Wiley & Sons, 1959.

LOCAL PLANNING

In assessing the current status of programmed self-instruction, it is evident that progress has been made in the development of this teaching method within a relatively brief period. The time seems ripe for experimental psychologists and educators to join forces in an effort to explore the relation of learning theory to the technology of education.

However, the expanding activity by foundations, private firms, and the Federal Government in supporting experimentation; the efforts expended by researchers working in psychological laboratories and classrooms; and the work of such groups as the Commission on Instructional Materials of the Association for Supervision and Curriculum Development in formulating a theory of learning to support use of new instructional media, will have little effect unless educators at the local level keep themselves informed about developments in this rapidly changing field and encourage modest programming activities in the classroom. Educational planning should include an assessment of the place of these new tools in light of local conditions.[5]

The saying that educational innovations must wait a half century before they are put into practice will probably not apply in learning technology, where change is taking place at a rapid rate. Educators should fully explore the contribution which the new teaching method can make to the instructional process.

FOR FURTHER READING

FRY, EDWARD B. AND OTHERS, "Teaching Machines: An Annotated Bibliography," Audio-Visual Communication Review (Supplement I), Vol. 8, No. 2, 1960.

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SKINNER, B. F., "Teaching Machines," Science, Vol. 128, No. 3330 (October 1958).

[5] Gene C. Fusco, "Technology in the Classroom: Challenges to the School Administrator, Part II, Issues and Implications" *School Life* (May 1960).

The Cross-Media Approach to Teaching

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RECENTLY the editor of one our leading educational journals and I were discussing an article on the "cross-media" approach when she stated, "Why this is nothing more than just good teaching." Perhaps we are oversimplifying the concept of cross-media to say it is just good teaching despite the fact this is basically true. We might best describe cross-media as the *how* of teaching; as a systematic approach to achieving our educational objectives.

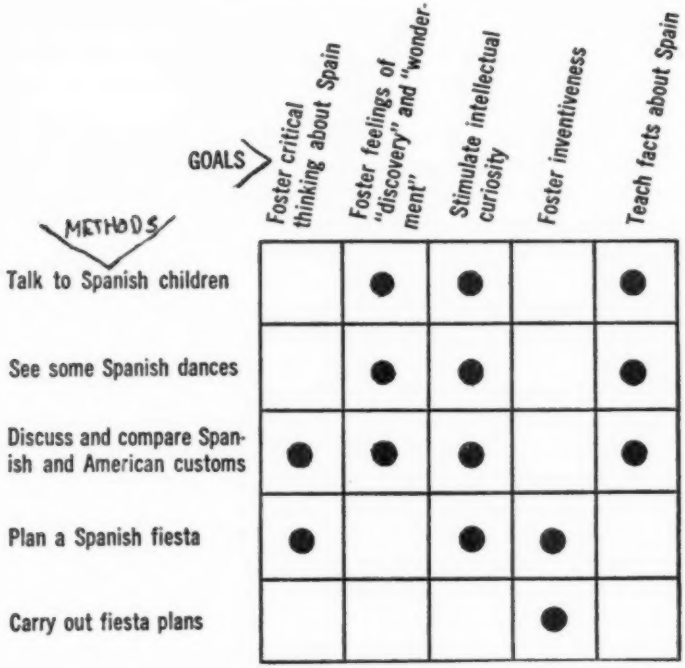
Several premises must be established before instructional media and materials can be efficiently utilized in what we call here the "cross-media approach." It is imperative that the teacher *understand* the potentialities and limitations of *all* the instructional resources available to him. It is vital that the teacher be an intellectual *user* of the tools of his profession. For example, the teacher would know *why* and *when* we turn to the educational film to accomplish a specific goal or goals. Secondly, he would know how to apply the use of that film to draw from it the richest learning experience possible. Multiply this one resource by the myriad of materials and media available to educators today and we have an example of the increasing skill needed to most efficiently plan our lesson for the day or our resource unit for a broader area of study.

Samuel L. Becker in "Opportunities for Learning: Guidelines for Television"[1] has given us a chart which is extremely helpful in visualizing the cross-media approach (Chart I).

Again we are reminded that we begin with the teacher's objectives or goals. What are the skills, attitudes, and facts we wish taught? How can we best teach them? In referring to his chart, Samuel Becker[2] states, "If we do this sort of analysis carefully enough and if we are at all imaginative in thinking of the best possible methods for achieving our goals, we will be in a better position to start thinking about the *possible* media and the *best* media for carrying out these methods in a particular area." Cross-media, therefore, is a good lesson planning with strong emphasis on the *how*.

[1] A report of a seminar held at NEA Headquarters May 16-18, 1959.
[2] Samuel L. Becker is Director, Division of Television-Radio-Film, State University of Iowa, Iowa City.

CHART I. ANALYSIS OF METHODS AND GOALS IN TEACHING SPANISH CUSTOMS



Two other necessary considerations in lesson planning are time and the availability of resources. The *time* the teacher has to develop her objective will always be a key factor in determining the media and materials to use. I might want to use a field trip to a factory to best illustrate and explain the assembly line production system, but be forced to do it vicariously with a film, filmstrip, or both to save time. If time permits the film or filmstrip might provide the preparation for the field trip or the summary upon returning. And we cannot expect to use media and materials not available. Here we are faced with one of the most serious problems of our profession. In a day of modern technology we are often a profession teaching for today and tomorrow with the tools of yesterday. We may be fully aware of the fact that the best way to teach concepts concerned with motion is often through the motion picture film, only to realize that the resource is not available. If it *is* avail-

able it may not be convenient to best achieve your objectives at the time you deem best. The cross-media approach is dependent upon *all* resources being readily available to the classroom teacher when she can best fit them into her plan. While continually planning with the administration for more and better materials, the teacher must use what resources are available. In this cross-media concept local *resources,* inexpensive materials, and teacher-student made materials must not be overlooked. As we complete our methods column (Chart I) we will find compensating ways when the "best" way may not be available. As you prepare your planning chart or outline you will quickly note that to achieve any single objective you will usually have several methods to select from. Whereas your students learn in different ways you may employ several methods at one time. Cross-media planning helps the teacher to quickly see these numerous activities in terms of stated goals. While an individual is at a table studying a filmstrip at his own speed, three or four students might be in another section of the room with earphones listening to a pre-recorded history lesson or mathematic exercise. Others might be reading or consulting with the teacher. Media, such as filmstrips, records, electric boards, study displays, flannel boards are not solely for the teacher's use. On the contrary, they are excellent tools for the students as well. The student who uses the opaque projector to project illustrations of his talk or project is stimulated to do a better job of reporting. He might prefer to tape part or all of his talk in order that he can evaluate his work or share it with others although he personally might not be present. Students as well as teachers must think more as communicators. Having knowledge is only part of the task that confronts us. Effective and efficient communication of our information to others is often our main task. Surely it is a prime responsibility of the teacher.

A brief look at a World History unit of study concerned with "Causes of War and Efforts for Peace" might demonstrate the cross-media approach to teaching. To begin motivating interest in the unit silent partner, the bulletin board, begins working. From a carefully prepared picture file I can draw upon examples of different wars. In bold captions the board will ask "What Caused This War?" Advanced reading assignments will also help to arouse interest. Introducing the unit will include lecture and discussion but I will use the educational film to provide students with experiences of the past which they can relive in no other way. To enable

me to conduct a lecture-discussion, the filmstrip may become my best tool. Each illustration can be discussed at the speed the class selects or the teacher selects. Class work enters into the picture with students illustrating their work on maps, graphs, and carefully selected pictures. These graphics prepared in sequence and shared with the class through the use of the opaque projector makes their reports more meaningful to the audience and more successful for the presentor. Recordings from the "You Are There" series, for example, forces us to *listen* tentatively to dramatic interpretations of various periods of history. We cannot overlook current events; for through the magic eye of the TV camera we are kept up-to-date with the latest world events. Learning in this instance, as well as in others, does not stop at the 3:30 bell but continues on into the home long after the school day. We could go on giving many, many more illustrations whereby we obtain our educational goals through a careful selection of materials and media. As each teacher does this for himself he realizes more and more that we cannot keep pace today with the "knowledge explosion" unless we do turn to the modern communication tools of our profession.

In the Bell Telephone Science Series film "Gateways to the Mind" they explicitly state that our sensory experiences are the pathways through which knowledge is received. We can provide these needed sensory experiences through the cross-media approach. By seeing, doing, listening, smelling, tasting and feeling we learn and we retain best that which is communicated to us. As teachers we must remember there is no one best way to teach a fact or concept to *all* students. There are several ways most material can be taught. Know your communication tools. Understand how they can best serve you. Utilize them to meet your objectives and those of the students. Provide your classroom with rich rewarding learning experiences so that as you teach you know you have selected the best ways to communicate with your students.

Book Reviews

K. C. Rugg, *Improving Instruction Budgeting Your Audio-Visual Program.* Bloomington, Indiana: Indiana University, 1960.

The Feasibility and Role of State and Regional Networks in Educational Broadcasting. Washington, D. C.: National Association of Educational Broadcasters, 1959.

These publications represent two of the dissemination efforts of the U. S. Office of Education under provisions of Title VII, Part B, National Defense Education Act. A number of these activities have been sponsored by the U. S. Office of Education during the last two years, and several outstanding publications and reports of conferences have materialized.

Rugg's booklet is the result of several years' effort to analyze the budgets of different sized school systems all over the United States with regard to provisions for audio-visual services. Twenty-eight programs are analyzed. No formula is presented to indicate the amount of money that a school system should budget for services nor are there suggestions for the available money to be spent. The material briefly points out what various school systems have done. School superintendents should find the booklet very helpful in planning for audio-visual services within their systems.

The Feasibility and Role of State and Regional Networks in Educational Broadcasting is the published proceedings of a conference held in September, 1959, by the National Association of Educational Broadcasters. Assembled at the conference were leaders in the field of educational broadcasting, in curriculum and teaching, in the technology of broadcasting, and in the administration of broadcasting and school programs. Many divergent points of view were expressed by the participants in the conference. Both opponents and proponents of network educational broadcasting had an opportunity to present their cases. Undoubtedly, the point was well made that, technologically speaking, networks were both possible and practical. Many questions are raised about the educational consequences of such a broadcasting scheme. This conference report should be read by all those concerned with the future developments of educational television. Certainly, the report is an important collection of authoritative opinions of the subject of regional educational broadcasting.

O. L. Davis, Jr.

Fry, Edward, Glen L. Bryan, Joseph W. Rigney. "Teaching Machines: An Annotated Bibliography," *Audio-Visual Communication Review,* Supplement 1, Vol. 8, No. 2. Washington, D. C.: Department of Audiovisual Instruction, NEA. $1.50.

Of all the technological devices now coming available for use in instruction, the one receiving the most attention in both research and development programs are those devices commonly referred to as teaching machines. While the term denoting these devices seem to have been a most inappropriate choice of names,

the implications of their use are being disseminated widely to the American public. Most of the work with regard to automated instructional devices has been done by educational and experimental psychologists.

This annotated bibliography, published in a special supplement to the *Audio-Visual Communication Review*, fills an important need in this field. Educational researchers and practitioners desiring to review the literature will find it especially helpful for it contains an annotation or listing of every article and study which the compilers could locate with reference to teaching machines. Some of the entries are more than annotations; they are extended abstracts and reviews of articles or conference reports. It is noteworthy that this supplement is already out of date, only a short half-year since it was published. The authors recognized this eventuality. Their efforts are certainly an important service for the profession.

O. L. DAVIS, JR.

PATRICIA O'CONNOR, *Modern Foreign Languages in High School: Pre-Reading Instruction*. Washington, D. C.: U. S. Government Printing Office, 1960. $.25.

Especially since World War II the new emphasis in foreign language teaching has been on the direct method, the aural-oral approach. The program outlined by Dr. O'Connor represents an adaptation of the new approach specifically to high school instruction. The program is limited to one phase, the pre-reading phase, of the total instruction period and, as such, is a supplementary method rather than a replacement to the more traditional grammar-translation-reading approach.

The objective of pre-reading instruction is to develop a familiarity with the spoken language through an intensive practice within a limited area of the language. Dr. O'Connor points out that the success of a pre-textbook program depends equally upon adequate planning and competent presentation.

With regard to the planning of a period of exclusively aural-oral work the most important factors to be considered include the selection of material, the rate of introduction of the material, and the recurrent use of the material. While the length of the pre-reading phase will vary according to the special objectives and the ability of the teacher the well-planned program is characterized by the careful selection of material, ordinarily material that can be easily co-ordinated later with the textbook phase of instruction.

Those factors important to the successful presentation of the aural-oral program include the use of interesting and appropriate teaching techniques and the limitation of the material presented. Dr. O'Connor reveals a particularly good understanding of the use of technique in a discussion of the variation of techniques required as the program progresses. The author is careful to point out that pre-reading instruction will be most effective when the material actually presented is rigidly controlled and limited to the material planned initially.

Although the aural-oral instruction program does not alter the basic role of the teacher as model, evaluator, and director in the classroom it does require the teacher to take a more than normally active part in the learning process. For this reason the teacher, in this program particularly, can effectively supplement his own ability with technological aids.

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